MEASUREMENT ERROR IN FAMILY BACKGROUND VARIABLES

THE BIAS IN THE INTERGENERATIONAL TRANSMISSION OF STATUS, CULTURAL CONSUMPTION, PARTY PREFERENCE, AND RELIGIOSITY

Measurement error in family background variables

The bias in the intergenerational transmission of status, cultural consumption, party preference, and religiosity

Meetfouten in gezinsachtergrond variabelen

De vertekening van de intergenerationele overdracht van status, culturele consumptie, partijvoorkeur en religiositeit

Een wetenschappelijke proeve op het gebied van de Sociale Wetenschappen

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Chapter 1: Introduction

1.1 Background

In their classic work *The American Occupational Structure*, Blau and Duncan (1967) investigated social mobility in the United States, using retrospective data about father's educational attainment and father's occupational status. They examined the degree to which answers of respondents on their father's socio-economic background might be distorted, and admit: "Although this study took some special pains to look into the incidence of data error, it must be conceded that very little was done to estimate the effect of such error on conclusions and inferences. In that respect, unfortunately, our investigation is all too typical of the current standards of social research." (p. 16). Now, almost forty years later, the Blau and Duncan model has been elaborated in many ways, including with regard to the role of measurement error. Still, looking at sociology in general, the question of whether, and to what extent, measurement error in retrospective data on family background distorts the effects of family background variables has not been investigated for the majority of sociological fields. This study aims to investigate whether errors in these data bias the effects in models of family background on the respondent's life chances and preferences.

In general, two important explanations for the effect of family background are (i) that children are socialized in their family of origin, where they develop preferences and values and (ii) that parents use their resources to benefit the (future) position of their children. In this study, we look at four sociological fields in which family background plays an important role, namely social stratification, cultural consumption, party preference, and religion. The socialization explanation applies to all four fields, whereas the resources explanation applies only to the fields of social stratification and cultural consumption. The main discussion in the four fields are the following:

(i) The sociology of social stratification and mobility focuses on the intergenerational reproduction of educational attainment and occupational status (Blau and Duncan, 1967; Sewell and Hauser, 1976; DiMaggio and Mohr, 1985; De Graaf, 1986). Both parental resources and socialization play a role in this reproduction. These studies offer better insights into inequality in a particular society. There has been a lively debate about which family background variables affect educational attainment and occupational status. Traditionally the focus has been on father's educational attainment and father's occupational status. Later, the models were been extended by parental cultural and material resources. According to Bourdieu (1970), highbrow culture plays an important role in educational reproduction. Cultural consumption is highest among the higher educated, which makes the children of the higher educated more familiar with highbrow culture. Since, familiarity with highbrow culture is beneficial to one's educational career, cultural resources, like reading behavior of

the parents and other cultural activities, have been included in status attainment models. Indeed, empirical research has corroborated the hypothesis that (parental) cultural participation has a positive effect on children's educational attainment (DiMaggio, 1982; De Graaf, 1986; Niehof, 1997). With respect to the trend in the effects of family background, two opposing theories exist. Modernization theory predicts that family background effects decline over time, while these effects remain stable according to reproduction theory. During the twentieth century, western society governments have tried to reduce unequal life chances that result from inequality in parental economic resources. But according to reproduction theory, the elite has used cultural resources as a compensating strategy.

(ii) Cultural consumption has been shown to be strongly related to family background (Ganzeboom, 1984). This is not only because cultural lifestyles are directly related to status culture - and thus to occupational and, especially, educational inequalities - but also because cultural socialization is such an important factor. Children who have grown up in a family environment in which cultural activities are part of the daily routines develop a taste for such activities, and as a consequence are culturally active when they become adults. Not only cultural consumption, but also other aspects of the lifestyle (leisure-time activities, media consumption, sports, eating and drinking habits) are directly related to practices in the parental home. We have chosen to investigate cultural consumption because of the strength of the relationship between parents and children.

(iii) Political sociology examines, among other things, the intergenerational transmission of political party preference. At first glance, one might expect party preference to be based particularly on the interests of respondents. However, parental socialization plays an important role here as well. Empirical research suggests that the more right-wing the parental party preference is, the more right-wing the party preference of their adult children (Need, 1997). Additionally, it has been established how class and religiosity affect voting behavior. This gives us more insight into the integration with respect to classes and denominations. People who vote according to their class interest (for example, manual laborers voting for the Labor Party) are assumed to be more integrated into their class than people who do not vote according to their class interest. People who vote according to their denomination (such as Roman Catholics voting for the Christian Democratic party in the Netherlands) are assumed to be integrated more strongly into their denomination than people who do not vote according to their denomination. This makes it important to know whether party preference is more influenced by one's own class and religiosity, or by the parental class and religiosity. For socially mobile persons, the parental class is not the same as their own class. If father's class has an effect in addition to one's own class, this suggests that socially mobile persons are not fully integrated into their own (i.e., new) class. Moreover, knowing whether parental characteristics or one's own characteristics influence voting behavior gives us information about how people make voting decisions. If one's own class has the strongest effect, people are assumed to make decisions on the basis of their own interests (i.e., the interests of their

class). They themselves decide which party best serves those interests. Empirical research has found that parental characteristics influence party preference in addition to adult children's own characteristics.
(iv) An important topic within the sociology of religion is the impact of parental religious practices on the religious attitudes and behavior of offspring. Socialization theory predicts that those who grew up in a liberal religious family are more likely to disaffiliate than those who grew up in a strongly religious family. In general, empirical research supports this thesis. It is not only parental religiosity that influences the probability of leaving church, but also other parental characteristics, for example those that represent aspects of 'rationalization', such as education. Education is assumed to support a rational view of the world that contradicts religious views.

1.2 Retrospective research

In social sciences, information on family background is routinely collected using a retrospective research design. Information on the social, cultural, and economic characteristics of parents is measured by asking respondents questions referring to the time when they were still living with their parents. This preference for a retrospective research design is understandable, since prospective panel studies imply serious disadvantages for research on the impact of social origins on social destinations. First, it would take a long time before researchers were able to estimate the association between family background and adult life chances. Second, the problems of attrition would be hard to solve in a prospective study in which the last wave is conducted thirty years or more after the first wave. Third, social research is often interested in historical comparisons. In a prospective research design, a historical comparison would be possible only if it is repeated for new birth cohorts, whereas a single retrospective survey covers the life-course of forty years of birth cohorts. It is thus no wonder that social researchers prefer retrospective measurement of family background characteristics. We do not wish to argue that panel studies have no advantages over retrospective research, but for our research topic — the impact of family background on adult life — panel studies do not get us much further.

In retrospective studies, the respondents answer questions about characteristics of their parents, like educational attainment, occupation, church attendance, and political party preferences. Respondents are usually asked to refer to the situation in which they themselves were between 12 and 15 years of age. Most of the questions asked are considered to be about salient characteristics (occupation, church attendance, material possessions), which are easier to remember than less salient (for example attitudinal) characteristics (Van der Vaart, 1996). Since at age 15 most respondents still lived with their parents, they must have heard about these basic indicators of their parents' socio-cultural economic position, which may give

some justification for the assumption that the information supplied by the respondents is reliable. This being so, it is self-evident that the information may not be completely correct (Blau and Duncan, 1967; Schreiber, 1975/1976). It is plausible to assume that the information that respondents supply about their parents is less reliable than the information they supply about themselves. In the first place, there will be additional measurement error because the survey questions refer to a situation in the past (Bradburn, Rips and Shevell, 1987; Eisenhower, Mathiowetz, Morganstein, 1991; for an overview of research see Dex, 1995). For the youngest respondents in a general population survey, the time already passed is only a few years, but the oldest respondents are asked to give information about a situation more than fifty years previously. A second reason why there could be additional measurement error is that the questions refer to characteristics of persons other than the respondents themselves. 'Proxy information' about other persons might be less accurate than information about one's own level of schooling or occupation (Blair, Menon, and Bickart, 1991; for an overview see Looker, 1989). Although the parents are close to the respondents, details about their schooling and work situation may not be so familiar to the respondents to warrant complete or even sufficient reliability.

With respect to the analytical use of retrospective family background data, four strategies are possible. The first is to exclude family background variables from the model, and to focus on the effects of current characteristics of the respondents themselves. Such a rigorous attitude is rarely found, since it would make it impossible to test hypotheses on family background, and may lead to omitted variable bias in the effects of respondent characteristics. The second is to use retrospective data and to neglect the fact that their measurement is likely to be error-prone. This strategy is often used, but we think that the assumption of negligible error is a rather strong one. A third strategy is to focus on the improvement of measurement and to investigate which survey questions provide the most reliable measurement. However, although a better formulation of survey questions will improve data quality somewhat, measurement without errors is impossible, so it is not feasible to delay the empirical testing of hypotheses until measurement is perfect. For that reason we take the fourth attitude: to find out what the consequences of measurement error are. Ultee (2004) argues that if empirical support for a hypothesis is found, while measurement error is present, the matter is whether these errors led to support for a hypothesis that in fact should be rejected, or whether measurement error led to a smaller degree of support than there would have been in the absence of error.

It is rather surprising that the degree to which measurement error in family background variables distorts the effects of these variables on life chances is still not clear, since the statistical methods for investigating this distortion have been available for years (for a description of the historical development of these methods see Bentler, 1986; Hägglund, 2001; Sörbom, 2001). However, there are two explanations why these distortions have hardly been investigated.

First, to investigate the distortion of the effect of family background variables, one needs multiple measurements of the same background variable. Because the process of collecting data is expensive and time-consuming, re-measurements and multiple measurements have often been restricted to small experiments (for an overview see Reimer, 2001). These are suitable for investigating the causes of measurement error, but not for investigating the consequences of measurement error. Furthermore, most researchers who investigate the quality of retrospective survey data, look at questions that refer to a short period in the past rather than data referring to the family background (eg. Van der Vaart, 1996).

Second, it is likely that there is no general solution to the problem. One needs to perform analyses for each model separately. Whether, and how, the effect of a family background variable is distorted always depends on which variables are used (either dependent or independent). If one investigates whether the effect of, for example, father's church attendance on party preference is biased by measurement error and finds that this is not the case, it is still very well possible that the effect of father's church attendance on, for example, children's probability of leaving church *is* biased. Thus, it is necessary to investigate separately each field of sociology in which family background variables are used.

1.3 Research questions

This book is concerned with three research questions. The first is: *To what extent do measurements of family background variables suffer from random and correlated measurement error?*
In the next section we will explain why it is important to distinguish between random and correlated error.

The second question is the main research question of this study*: To what extent are the effects of family background characteristics on individual life chances under- or over-estimated by random and correlated measurement error?*
To investigate this distortion due to measurement error, we will use our data first to replicate the effects of family background in sociological models of status attainment, educational attainment, cultural consumption, party preference and religious disaffiliation as they are usually estimated, using only information provided by the respondents (adult children in the analysis). Thus, we will answer the question regarding what the effects of family background characteristics on individual life chances are, if family background is assumed to be measured without error. Next, we will estimate the effects of family background on life chances, using multiple measurements of family background characteristics in order to include measurement error. These multiple measurements are the answer of the original respondent (called the 'primary respondent'), the answer of a parent of the primary respondent, and the answer of a sibling of the primary respondent. Further, we cope with correlated measurement error.

The third research question reads: *To what extent is it possible to correct for under- or overestimation due to random and correlated measurement error?*
If effects are biased by measuerement error, it is important to correct for the bias. We will show that it is also possible to correct the estimates for measurement error when one does not have multiple measurements, by using the outcomes of our analysis.

The scientific relevance of this project has three elements. First, we will not only look at random measurement error, but also at correlated measurement error. In other words: we do not only look at the size of the error, but also at the character of the error.

Second, instead of focusing on the reliability of *variables*, we focus on the bias in structural *effects*. We do not just investigate whether, and to what extent, *concepts* are measured reliably; we ask whether the signs and magnitudes of *parameters* of structural models change as a consequence of measurement inaccuracies. This rewording of a question recognizes that theories do not simply consist of concepts, but of propositions (relations between concepts). Research on the reliability of variables will not suffice in order to investigate the quality of retrospective research. Up till now, most researchers have investigated whether single variables have been operationalized in a valid and reliable way. Of those who have empirically looked at biases in estimated *effects* as a consequence of incorrect answers to survey questions, the majority was restricted to social stratification (Weiss 1968/1969; Weaver and Swanson, 1974; Mason, Hauser, Kerckhoff, Poss, and Manton, 1976; Bielby and Hauser, 1977; Bielby, Hauser, and Featherman, 1977a, 1977b, 1977c; Broom, Jones, McDonnell, and Duncan-Jones, 1978; Corcoran, 1980, 1981; Mare and Mason, 1981; Hauser, Tsai, and Sewell, 1983; Massagli and Hauser, 1983; De Graaf, Poortman, and Ultee, 1996; Van Eijck, 1996; Van Goor and Verhage, 1997).

Third, since this research obtains information on both the size and the character of the measurement error, we make it possible for the estimates of future research on family background effects that does not have access to multiple informants to be less biased.

1.4 Measurement theory

Much has been written about measurement and measurement error. This section will discuss only those aspects necessary to understand the present study. We will show that it is not possible to predict beforehand what the consequences of measurement error are, unless one knows the level of the measurement error (the error variances), whether and how strong the errors are correlated (the error covariances), and the relations between the variables in the analysis (variances and covariances). For a more extensive overview of this topic, we refer to Carmines and Zeller (1979), Bollen (1989), and Dunn (2004).

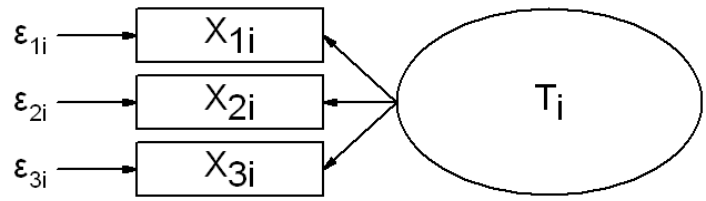
1.4.1 Reliability versus validity

Bollen (1989) defines measurement as the process by which a concept is linked to one or more latent variables, and by which these latent variables are linked to observed variables. Measurement is done in all empirical sciences. With respect to measurement error, two concepts are important, namely validity and reliability.

The validity of a measuring procedure refers to the degree in which it measures what it is supposed to measure (Carmines and Zeller, 1979). The reliability refers to the extent in which the measuring procedure yields the same results if it is repeated (Carmines and Zeller, 1979). The assumption of valid measurement is a stronger one than the assumption of reliable measurement; an unreliable measurement cannot be valid, but an invalid measurement can be reliable. To give an example from Siegel and Hodge (1968): using education as a measurement for someone's Social-Economic Status (SES) may be very reliable (if the same answer is obtained in several measurements). However, it will not be very valid since SES is more than education. A valid measurement of SES should also look at occupation and income. Instead of focusing on the distinction between validity and reliability, we formulate our research questions in terms of random and correlated error (Sections 1.4.2 and 1.4.3) to investigate the consequences of measurement error.

If one has several measurements of a characteristic, it is possible to say something about the true characteristic, although each of the measurements contains measurement error. The true characteristic without measurement error is unobserved, i.e., it is a latent variable. This latent variable influences the measurements (the observed variables). The reliability of an observed variable x_i is based on the magnitude of the direct effect that a latent variable has on x_i (Bollen, 1989). However, the measurements are not only influenced by the latent variable, but also by measurement error. Figure 1.1 shows a measurement model in which a latent variable (T_i) is measured by three indicators (X_{1i}, X_{2i}, and X_{3i}).

Figure 1.1 Measurement model



To understand how measurement error is taken into account, it is important to look at how reliability, correlations and error variances are related to each other. For the deduction of these relations see Dunn (2004).

1. The value of an indicator is the value of the true score plus error:
   X_i (an indicator) = T_i (true score) + ε_i (error).
2. The correlation between an indicator and its latent variable is the square root of the reliability.
3. It is assumed that the only relation between two indicators is via the latent variable. Hence, the correlation between the indicators X_1 and X_2 is via two paths, namely $T \rightarrow X_1$ and $T \rightarrow X_2$. The correlation is the product of these two paths. Each of these paths is the square root of the reliability of the indicator (previous statement). If these reliabilities are about equal, the correlation between two indicators is equal to the reliability of either of them. Therefore, these correlations are important in research on reliability.
4. If the error is unrelated to the value of the true score, the variance of the indicator is the variance of the true score plus the variance of the error.
5. The reliability of an indicator is the variance of the true score, divided by the variance of the indicator: reliability = $(\sigma^2_{true})/ (\sigma^2_{obs}) = 1 - (\sigma^2_{error})/ (\sigma^2_{obs})$. The reliability of an indicator can be established by calculating the correlation with another indicator (see statement 3). The variance of an indicator can also be easily calculated. Combining this information with the formula the error variance can be easily calculated. This error variance can be used to correct the regression effects for measurement error (Hayduk, 1987).

It is important to note that the reliability of the measurement of a latent variable is not equal to the reliability of each of its indicators, but on the basis of the correlations between the indicators, the reliability of a latent variable can be calculated using the formula for Cronbach's alpha (Carmines and Zeller, 1979):

$alpha = N \times r_{mean} / (1 + (N-1) \times r_{mean})$
N = the number of indicators/items
r_{mean} = the average of the correlations between the indicators

It is generally assumed that the reliability of a latent variable is acceptable if Cronbach's alpha is .80 or higher (Carmines and Zeller, 1979). However, even then the measurement error may distort the effects (see Section 1.4.2). This makes it important to discuss the consequences of measurement error, which will be done in the next sections.

1.4.2 Random measurement error

In general, the consequences of measurement errors depend on whether the errors are random or correlated (systematic). Many errors occur during survey research. They can result from a lack of precision in the questions in the questionnaire, or from a lack of precision in the answers that respondents provide. Errors can also occur during the data entry process (typing errors) or when correct information is coded incorrectly. Errors are random if the direction of the error is not correlated with characteristics of the respondents or, in this study, with characteristics of the parents of the respondents. In addition to the distinction between random and correlated measurement errors, it is important to distinguish between models with one independent variable and models with more than one independent variable. Let's start with the simplest case: random measurement in a bivariate analysis.

1.4.2.1 Random measurement error in bivariate analyses

In bivariate analyses, random measurement error in the dependent variable leads to a correct estimate of the (unstandardized) regression slope, but an underestimation of the correlation between the dependent and the independent variable (Blalock, 1970) and hence to an underestimation of the standardized effect. Thus, the bias in the standardized effect is not the same as the bias in the unstandardized effect. Random measurement error in the explanatory variable (and that is what this study focuses on) leads to an underestimation (attenuation) of the effect of that variable on the dependent variable (Bohrnstedt and Carter, 1971; Wansbeek and Meijer, 2000; Fox, 1997). Thus, if the analyses of the effects of family background were bivariate, random measurement error in a family background variable leads to an underestimation of the effect of family background on adult life chances and thus to an overestimation of social mobility (in the case of mobility research). The true correlation between two variables is equal to the estimated correlation divided by the square root of the product of the reliabilities of the variables (Spearman, 1904; Bohrnstedt and Carter, 1971; Carmines and Zeller, 1979; Bedeian, Day, and Kelloway, 1997). This implies that the correlation will be underestimated by 20 percent if both variables are measured with a reliability of .80. In the hypothetical situation that one variable is measured with a reliability of .80, while the other variable is perfectly measured, the correlation will still be underestimated by 11 percent (the square root of .80 × 1 is .89).

1.4.2.2 Random measurement error in multivariate analyses

The bivariate case is straightforward, but family background effects are usually estimated with multivariate analyses rather than bivariate ones. In multivariate analyses, ignoring random measurement error in variables can lead to a lower, a higher or the same estimation as the true effect of these variables (Bollen, 1989). Moreover, the effects of variables that are measured without error but correlated with the variables with error may also be biased (Hanushek and Jackson, 1977; Wansbeek and Meijer, 2000). For example, in the hypothetical case where an explanatory variable X has been measured without error, but an intermediate variable Z between X and the dependent variable Y contains error, the direct effect of X on Y is overestimated (since the effect of Z is not appropiately controlled for). A similar bias occurs if random measurement in one independent variable is larger than in a second independent variable and the two variables are correlated with each other.

It is indeed possible that random error is larger for some family background variables than for others. For example, in the Netherlands, father's education is less visible than father's occupation (and the level of the education may even be less visible than the direction of the education); cultural activities of parents (outside the home) are less visible than material possessions; and party preference is less visible than church attendance. This may result in higher random error in father's education, parental cultural participation and father's party preference than in father's occupational status, parental material possessions and father's church attendance. In turn, this could result, for instance, in an underestimation of the effect of father's education on respondent's education, and in an overestimation of the effect of father's occupational status (controlling for father's educational attainment). An overestimation of one explanatory variable and an underestimation of another explanatory variable is also possible if random measurement error in the two explanatory variables is about equal.

In a multivariate analysis it is only possible to calculate whether random measurement error leads to an under- or an overestimation of effects if the sizes of the errors in the different variables and the covariance matrix of the variables are known (Bohrnstedt and Carter, 1971). Therefore, it is not possible to predict beforehand whether effects are under- or overestimated. However, the population multiple correlation coefficient (the R^2) is underestimated (Bollen, 1989). Thus, on average, standardized effects are underestimated[1].

[1] An underestimation of the standardized effects does not necessarily mean that the unstandardized effects are underestimated. In Section 1.4.2.1 we noted that the standardized effect can be attenuated, whereas the unstandardized effect remains the same.

1.4.3 Correlated measurement error

The measurement error in a variable may not be random, but rather correlated with errors in other variables. In general, correlated measurement error is considered to be more serious a problem than fully random measurement error, since correlated measurement error is more likely to lead to an overestimation of an effect, and hence to lead to the corroboration of a hypothesis; that should be rejected.

Measurement errors are correlated if the errors are related to characteristics of the respondents or their parents[2]. One source of correlated measurement error occurs when a tendency to give socially desirable answers is related to individual characteristics. For example, if higher educated respondents overstate the educational level of their parents and if they do so more than lower educated respondents, research would produce a too strong association between parents' and respondent's educational attainment. Halo effects (automatically giving the same answer to different questions) or remembering a wrong answer to one question that influences the answer to another question are other reasons why measurement errors could lead to correlated measurement errors, since they magnify the correlations between variables. We do not know of any elaborated theory on the direction of the bias in family background research, but we do have two preliminary hypotheses. Errors in family background variables might be correlated with characteristics of the respondent (see Section 1.4.3.1) or they might be correlated with other characteristics of the parents (see Section 1.4.3.2). These two kinds of errors are represented in Figure 1.2.

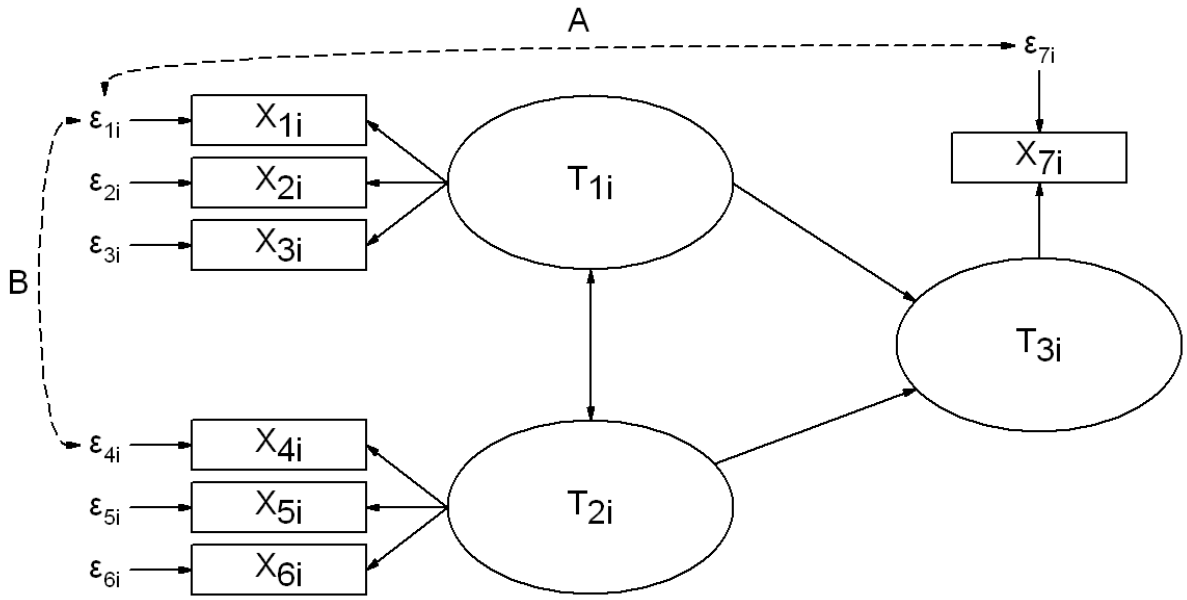
1.4.3.1 Bias toward respondent characteristics (A)

The first hypothesis is that answers to retrospective questions about family background, when asked for the situation when the respondent was between 12 and 15 years old, are biased in the direction of the present characteristics of the respondent, represented by effect A in Figure 1.2. The reason is that respondents may, intentionally or unintentionally, have a preference to minimize the social distance between themselves and their parents. A classical finding from psychological research is that people tend to minimize the differences in personality, taste, and status with people for whom they have affective feelings (Fiedler, Warrington, and Blaisdell, 1952; Michaelson and Contractor, 1992), and this mechanism may be present for the relationship between parents and children. An opposite, to us less plausible, argument is that people, again intentionally or unintentionally, tend to underestimate their parents' educational attainment or occupational status to make it look as though they (the resondents) have achieved their current professional status, without parental support (Broom, Jones,

[2] Since characteristics of parents are included in our models, errors that are related to parental characteristics have to be treated as correlated errors, since they can bias the effects in our models (see Section 1.4.3.2).

McDonnell, and Duncan-Jones, 1978). If this tendency occurs especially among the successful people, the correlation between family origins and achieved status may be underestimated.

Figure 1.2 Correlated measurement error



T_{1i} and T_{2i} = family background characteristics

T_{3i} = characteristic of respondent

A = bias towards respondent characteristic

B = bias towards family background characteristic

In summary then, we assume that respondent information about family background is biased toward characteristics of the respondents themselves, and that this leads to an overestimation of the effect of family background on respondents.

1.4.3.2 Bias toward other parental characteristics (B)

Another way in which measurement error may influence the effects of family background on life chances occurs when the answers to questions about family background are made more consistent than they really are, represented by effect B in Figure 1.2. This is our second hypothesis. Bias towards other parental characteristics may be the case if respondents want to make several situations in the past consistent with each other (e.g., 'My father had an

important job, so his education was probably high as well'). This probably happens unintentionally: missing information regarding one family background characteristic is guessed on the basis of information about other family background characteristics. This leads to an overestimation of the correlation between father's occupational status and father's educational attainment, which may imply that the effects of these variables, controlled for each other, are underestimated, due to some collinearity. Note that correlated error makes construct validity (determining the validity of a variable by looking at whether that variable is correlated with other variables in a way that was expected from a theoretical perspective) unsuitable for assessing the validity.

Achen (1985) shows that correlated measurement error can even lead to reversed signs of the regression coefficients. This only happens under certain conditions; if: (i) two explanatory variables have much error, (ii) the errors are highly correlated, (iii) the two explanatory variables are proxies of the same underlying variable (or are highly correlated with each other), and (iv) the two explanatory variables have about the same true (standardized) effect on the dependent variable, then the sign of the variable with the lowest reliability will be reversed.

1.4.4 Combining the effects of random and correlated measurement error

One could argue that the underestimation and the overestimation of effects cancel each other out, which leads to the true effects. However, this would be very coincidental; effects might as well be underestimated or overestimated. It is clear that all considerations do not lead to straightforward hypotheses about the consequences of measurement error on the effects of family background. Empirical research must show which arguments carry the most weight. Without applying empirical research, both the attitude of completely neglecting measurement error (as if they are known not to affect the results) and the attitude of rejecting the use of retrospective family background data (as if they are known to lead to completely distorted effects) are preliminary.

1.5 Research design and data

1.5.1 Research design

In the literature on measurement error in retrospective questions, three research designs can be distinguished. We will label these three designs the multiple moment design, the multiple source type design, and the multiple informant design.

In the multiple moment design respondents are asked the same questions more than once, for example in the successive waves of a panel study. In this way, multiple maesurements of one variable are obtained. A problem of the multiple moment design is the possibility that respondents give the same wrong answer twice because they remember the answer they had previously given. This leads to an overestimation of the reliability. This effect of remembrance is particularly problematic if the time between the two surveys is short. The longer the periods between the moments at which the same questions are asked, the less likely it is that an overestimation of reliability will occur, and the higher the estimated error. Research has shown that the reliability coefficients of father's educational attainment and father's occupational status are highest (.94 and .87 respectively) when the moments are three weeks apart (Bielby and Hauser, 1977; Bielby, Hauser, and Featherman, 1977a, 1977b, 1977c), lower (.72 and .76) when the moments are two years apart (Hope, Schwartz, and Graham, 1986), and lowest (.68 and .75) when the moments are eleven years apart (Hauser, Tsai, and Sewell, 1983). In our view, the unreliability coefficient depends too strongly on the period of time between the surveys when the multiple moment design is used. A further, operational problem of the multiple moment design is caused by attrition, which is most problematic if the measurements are far apart.

In the multiple source type design, different *types* of sources are used, for example retrospective survey data provided by respondents are compared with external registered data such as registered data in government files or with data from pay-rolls. The second source was not collected for research purposes. This design has been used for father's occupational status and family income, but not for other family background variables as far as we know. This is because there are no sources available to look up other family background variables (like church attendance or party preference). In general, privacy regulations can be a serious handicap for this design, and not many applications of the multiple source type design can be found in the literature. The multiple source type design is sometimes used to compare the distributions of retrospective research (Blossfeld, 1987), but in such cases there is no direct comparison on the individual level and no estimates of the consequences of measurement error can be derived.

In the multiple informant design, more than one person is asked the same questions, for example primary respondents, parents, and siblings. The multiple informant design has two disadvantages. First, it is often impossible to interview all relevant informants. Response rates among parents and siblings may be low; older respondents often will not have parents still living. A second, and we think less serious disadvantage is that different sources could give the same wrong answer. If they all give the same wrong answer, the quality of the family background data is overestimated. Nevertheless, although parents and siblings can give wrong answers too, the errors in these answers are unlikely to be related to characteristics of the respondent.

We believe that the multiple informant design is the preferred design for our study. The multiple source type design is not feasible for most family background variables. Both the multiple moment and the multiple informant design suffer from the problem that multiple measurements are not obtained for all respondents, in the former due to panel attrition and in the latter due to non-cooperating parents/siblings. Moreover, for both designs, it is possible that the same wrong answer is obtained at the different measurements. Nevertheless, we think that this is more likely with the multiple moment design (due to remembrance), while with the multiple informant design we have independent sources. In addition, with the multiple informant design one gets answers whose errors are unlikely to be related to respondent characteristics, while with the multiple moment design, errors in all answers
may be correlated with respondent characteristics, since all answers are given by primary respondents themselves.

1.5.2 Models: Structural equation measurement models

We use structural equation modeling to investigate the influence of random and correlated measurement error in family background variables on the estimated effects on adult children's life chances. Each family background variable is considered to be a latent variable, measured by three indicators, stemming from three informants: the primary respondent, a parent, and one randomly selected sibling[3].

In the estimated models, we can find answers to the question of whether correction for measurement errors leads to different estimates of the effects of family background. An additional benefit of our analyses is that we can present reliability coefficients, which in the future can be used to correct for measurement error. We will estimate this model with the LISREL software (for models with a continuous dependent variable) and with the Mplus software (for models with a dichotomous dependent variable).

We assume that the reports of respondent's own characteristics are subject to measurement error too. Since we have multiple measurements for these variables in the survey conducted in 2000 that we will use (discussed below), we can correct for measurement error in the respondent characteristics. In the 2000 survey, the parents were asked about the characteristics of their children. With these data we can estimate the reliability of the answers of the respondents about themselves. On the basis of the reliability, the error variances can be computed by hand (Hayduk, 1987), and these can be included in the measurement model. Further, we assume that respondent's birth year and sex are not subject to measurement error, since previous research has shown that these variables are measured reliably (Schreiber, 1975/1976; Porst and Zeifang, 1987; Poulain, Riandey, and Firdion, 1992).

[3] From now on, we use the term respondents for the primary respondents only.

In each of the empirical Chapters 2, 4, 5, 6, and 7, we estimate four versions of the same model. The first version is based on information from respondents only, which is assumed to be measured without error. This is the way in which the sociological models are usually estimated. In the second version, we allow for random measurement error by including the answers of parents and siblings in the model. Correlated measurement error is incorporated in the third version. In the fourth version, again, information from respondents only is used. However, now the effects are corrected for measurement error, using the information found on the error in versions two and three. In Chapter 3 on cohort effects, we estimate only two versions, both based on information from respondents only. The first is a version without measurement error, whereas the second model corrects for measurement error, using the findings of Chapter 2.

1.5.3 Data

The data we analyze are from the repeated cross-sectional retrospective life-course Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000). In these three surveys, primary respondents and their partners (married or unmarried) were interviewed in face-to-face interviews and were asked to fill out self-completion questionnaires. Samples were drawn from the population registers from a representative selection of Dutch municipalities (75, 70, and 67 municipalities in the three surveys, respectively). The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents respectively (giving a total of 4,590 respondents).

Many of the older respondents do not have any parents still living. Because we want to avoid the parental source addressing respondents in an age range different than the respondent and sibling sources, we included only respondents of 54 years or younger in the analysis. Of these respondents, 85.6 percent had at least one living parent at the time of the interview. In addition, about 89.5 percent of the respondents (in the 1992 and 2000 surveys[4]) reported having at least one living sibling.

Respondents were asked to give their parents' address and the address of one randomly selected sibling. The siblings and parents were then sent a questionnaire by mail, with a stamped return envelope. After two reminders, the second one again accompanied by the questionnaire and return envelope, completed parent questionnaires were received for 43.3 percent of the respondents with living parents. The response rate of siblings under respondents with at least one living sibling was 39.4 percent. The non-response has two

causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all questionnaires contain all information we would like to include in our analysis: in 1998, parents were only asked about their education and church membership, but not about their other characteristics at the time the primary respondent was 15 years old, and in all three questionnaires no questions were asked about deceased spouses of the surviving parent.

1.5.4 Missing data

As noted in Section 1.5.3, we do not have complete information provided by parents and siblings for all respondents. For 7 percent of our respondents, we have complete information from all three informants on all variables. For 5-6 percent (depending on the model that is estimated) we do have information provided by a parent, but no sibling information. The group of respondents of whom we have information provided by a sibling, but no information provided by a parent is 9-11 percent of our sample. For 15-17 percent of our respondents, we do not have information provided by a sibling and only parental information on educational attainment and church membership. These are mainly respondents from the 1998 survey, in which only part of the questions on family background were posed to parents, while siblings were not questioned about family background at all. The group of respondents of whom we only have information provided by primary respondents is 60-62 percent of all respondents.

Common ways of dealing with missing data such as listwise deletion, pairwise deletion and imputation techniques may bias the results severely. Listwise deletion would mean restricting our analyses to a smaller and unrepresentative sample. Pairwise deletion implies that the covariance matrix is estimated using pairwise deletion of missing values. The analyses are performed on this covariance matrix. This procedure leads to biased estimates if, for example, in the subgroup with parental information, the relation between father's educational attainment and son's/daughter's educational attainment is lower. In that case, the covariance between the parental answer on father's educational attainment and son's/daughter's educational attainment is lower than the covariance between the respondent answer on father's educational attainment and son's/daughter's educational attainment, not because of a difference between the parental and the respondent answers, but because of a difference between the groups for which the covariances are computed. Imputation biases the estimates too. Mean imputation of parent and sibling answers would imply that the relation between the answers of respondents, parents, and siblings is severely underestimated. Using multiple imputation, the answers of parents and siblings on a variable are best predicted by the answers of respondents on the same variable; this would strongly overestimate the relation between the answers of respondents, parents, and siblings.

[4] In the 1998 survey, siblings were not questioned about their parents.

Since conventional approaches to missing data may lead to biased estimates, we discuss three more sophisticated approaches for dealing with missing data (Enders, 2001). The first is imputation using the EM (expectation maximization) algorithm. The second is the multiple-group option. The third is Full Information Maximum Likelihood (FIML).

With imputation using the EM algorithm, missing values are replaced by the conditional expectation of the missing data given the observed data (Enders, 2001).

The multiple-group option implies that respondents are placed into groups on the basis of their missing value pattern. In the LISREL software (and other Structural Equation Modeling software packages) it is possible to include all groups in one analysis. If an indicator is missing in a group, the means and the covariances of that indicator with all other variables in the analysis are constrained to zero, while the variance is set to one. Also, the effect of the latent variable on this indicator is fixed to zero (Jöreskog and Sörbom, 1996). Furthermore, the regression effects are restricted to be equal over the five groups[5]. The means of the indicators (if they are not missing) in the different groups have to be restricted to be equal if the data are missing at random (MAR) instead of missing completely at random (MCAR). Since this method gives reliable results if data are either MAR or MCAR (Allison, 1987), possible differences between the groups are not worrying. The estimated effects are also corrected for measurement error in a group in which only one indicator for a latent variable is present, since the errors are restricted to be equal to those in the groups of the respondents for whom information on multiple indicators is present.

Full Information Maximum Likelihood is comparable to the multiple-group option. Here, the number of missing value patterns is calculated automatically by the statistical program used. However, the model is not estimated on the basis of the covariance matrices of the different groups, but on the basis of individual-level data. As a result, one does not obtain a covariance matrix on the basis of which the analyses can be replicated. The covariance matrix presented by LISREL is only used to obtain starting values. With the estimated covariance matrix of the saturated model, the results cannot be replicated either, since by only using a single covariance matrix, the necessary information on the missing value structure is lost. We explored both the multiple-group option and FIML to estimate our models. The parameter estimates did not differ between the two approaches; neither did the significance level of the structural effects. Calculating the significance of the error-covariances on the basis of the Chi-square difference test did not reveal differences between the two approaches either. Nevertheless, assessing the significance on the basis of the t-values did lead to different levels of significance, with the t-values being higher if FIML was used. This is a consequence of the fact that when using FIML, the t-value and the Chi-square difference test

[5] In addition, the number of degrees of freedom as computed by LISREL must be corrected. The real number of degrees of freedom is lower than computed because the total number of values set to zero or one in the covariance and means matrices of the five groups have to be subtracted from the computed number of degrees of freedom (Jöreskog and Sörbom, 1996).

lead to inconsistent results, whereas with the multiple-group option the results of the Chi-square difference test and the t-value are consistent with each other.

We do not use EM-imputation, because using this method led to an overestimation of the relation between the answers of respondents, parents, and siblings. Moreover, this method leads to biased estimation of the model fit and of the significance levels of parameters (Enders and Peugh, 2004). Since we want to give the reader the possibility to replicate our analyses, we use the multiple-group option for the models on social stratification, cultural consumption, and party preference and present the covariance and means matrices that are the input for the analysis in Appendix II. Unfortunately, in Chapter 7 (on church leaving) the multiple-group option is not feasible, since the dependent variable is a dichotomous variable and we had to perform a probit analysis using Mplus. In this case, it is not possible to restrict the unexplained variance in the different groups to be equal (which is necessary for the multiple-group option). Therefore, we use FIML in Chapter 7.

But what if data are not missing at random? It is very well possible that it is especially the most motivated parents and siblings, who give the most reliable answers, who return the questionnaire. This does not necessarily cause any problems. We allow the errors in the answers of parents and siblings to differ from the errors in the answers of respondents. If parents and siblings are a more selective subgroup giving more reliable answers, this does not influence our estimate of the error in the answers of respondents. Another cause of non random missingness is that we may have parental questionnaires of especially those respondents who have the best contacts with their parents, since those respondents are most likely to give the (correct) address of their parents, and those parents are most likely to cooperate with a survey in which their son or daughter participated. Moreover, those respondents might be more likely to give reliable answers about their parents. We have tested these assumptions using information about the contact between parents and children. Indeed, we obtained a lower parental response rate for respondents who hardly have any contact with their parents. Fortunately, the group of people having little or no contact with their parents is very small: 2 percent visit their parents once a year or less, 8 percent are visited by their parents once a year or less, and 11 percent have telephone contact with their parents a few times a year or less. In addition, no difference in parental response rate exists between those respondents who have intermittent contact with their parents and those who have frequent contact with their parents. More importantly, the correlation between the answers of respondents and parents is not lower for those respondents who hardly have any contact with their parents than for those respondents who have intermittent or frequent contact. This makes it less likely that our estimate of the reliability is biased by selective non-response.

1.6 Outline of this book

The four sociological fields studied in this book are investigated in the next six chapters. Three chapters address the field of social stratification: Chapter 2 focuses on status attainment, Chapter 3 on trends in the effects in the status attainment model, and Chapter 4 presents an educational attainment model in which direct measures of parental cultural and material resources are included. Chapters 5, 6 and 7 each address one sociological field, namely cultural consumption, political sociology, and the sociology of religion, respectively.

Chapters 2, 4, 5, 6, and 7 have the same structure. First, previous research on the topic is discussed. On the basis of this research, we decide which family background variables to include in the model. Second, if present, the literature on measurement error in the specific field is discussed. Third, some descriptive statistics are offered, including the agreement between the answers given by the different informants and the reliability of the background variables. Further, the model based on information from only primary respondents is analyzed. Subsequently, the model with random measurement error, based on the answers of the three informants, is presented. Then, we try to assess whether correlated measurement error is present, followed by a model in which correlated measurement error is explicitly included. The final model is a model in which only information from respondents is used, combined with information on their reliability. This is done to show that the information about measurement error found in this research can easily be used for future research in which only information given by one informant is present.

In the final chapter of this book we draw some conclusions and discuss to what extent our findings can be generalized (towards other models and towards other countries), and formulate questions for further research.

Chapter 2: Status attainment

Summary

This chapter investigates whether conventional retrospective measurement of family background leads to biases in the effects of family background in status attainment research. The results show that the effect of father's educational attainment on respondent's educational attainment is 41 percent greater than conventional research suggests, and that the effect of father's occupational status on respondent's educational attainment disappears. The direct effect of respondent's educational attainment on respondent's occupational status is 21 percent greater if one takes the unreliability in the respondent's answers into account.

2.1 Introduction

Who gets what and why? This, in short, is what the inequality problem in sociology is all about (Ultee, Arts, and Flap, 1992). *What* people get often is ascertained on the basis of their achieved occupational status. This makes it important to investigate *who* gets the jobs with high status and *why*. People can gain a good position on the basis of ascription (inherited characteristics) or on the basis of achievement (abilities of a person that are relevant for a job, such as knowledge and skills). Achievement is considered to be the way to divide wealth in modern society. Blau and Duncan (1967) showed that educational attainment is indeed an important determinant of status attainment. However, father's occupational status turned out to have an important effect as well. Moreover, father's educational attainment and father's occupational status affect educational attainment. This implies that family background not only has a direct effect on occupational status, but also an indirect effect via educational attainment. The results of Blau and Duncan have consistently been replicated. We restrict our discussion of previous research to the Netherlands.

In the Netherlands, father's educational attainment and occupational status both have positive effects on the respondent's educational attainment (De Graaf and Ganzeboom, 1993; De Graaf and Luijkx, 1993), but the effect of father's educational attainment is much stronger than the effect of father's occupational status. This finding has often been used to argue that the cultural dimension of social stratification plays a greater role in the Dutch process of status attainment than the economic dimension of social stratification: in the Netherlands, culture is more important than money for furthering one's offspring's life-course (De Graaf, De Graaf, and Kraaykamp, 2000). Furthermore, the respondent's occupational status is strongly dependent on the respondent's educational attainment, but the effect of father's occupational status is substantial too (De Graaf and Luijkx, 1995).

Although the corroboration for the existence of family background effects is strong, a disadvantage of social mobility research is that information on family background is collected through a retrospective research design. Respondents answer questions on the socio-economic status of their parents, specifically on the educational attainment and the occupational status of their fathers and (sometimes) of their mothers. Respondents are asked to recall to the situation in which they themselves were between 12 and 15 years of age. Since the questions refer to a situation in the past and refer to someone other than the respondent, answering these questions correctly can be problematic.

In Section 1.4 we argued that the bias of family background effects caused by measurement error depends upon whether the error is random or correlated. Random error leads to an underestimation of bivariate effects between variables. In a multivariate analysis, random errors can lead to both under- or overestimated effects. Errors in the answers of respondents about their father can be correlated with either other characteristics of the father or with characteristics of the respondents. If errors in answers on different background variables are correlated with each other, the relation between these explanatory variables will be overestimated, which can also influence the effects of these variables on characteristics of sons and daughters. If errors in answers on fathers are correlated with errors in answers on respondents, the influence of fathers on their sons and daughters will be overestimated.

In this chapter we address the question of the extent to which the familiar estimates of the status attainment process are affected by the retrospective and other-report design. We estimate linear structural models in which we include the information given by the primary respondents, one of their parents, and one of their siblings, and see whether the model estimates differ. This chapter focuses on analyses without historical comparisons in the parameters of the status attainment process; cohort effects will be examined in Chapter 3.

The status attainment model that we estimate deviates in three ways from the status attainment model as proposed by Blau and Duncan (1967). First, we have included men and women in one model, while controlling for sex. Men and women are analyzed together to increase statistical power and because we will not investigate male/female variation in the reliability of the information on family background. Second, to simplify our analysis we do not include first occupation in the model; life-course development in occupational status is controlled for by the inclusion of the respondent's age in the model. Third, we limit the sample to respondents between ages 25 and 54. The information from older respondents is not useful for our analysis since few will have living parents who can participate in the survey, and—when they do have parents still living—these will be very old, which would lead to a low response rate.

2.2 Previous research on bias in status attainment models

In the literature on measurement error in retrospective questions, three research designs can be distinguished (see Section 1.5.1). The first design is to ask respondents the same questions more than once, for example in the successive waves of a panel study. The second design is to compare the retrospective information provided by respondents with external data, for example with registered data in government files. The third design is the one used in this book: ask the same questions to more than one person. We have labeled these three designs the multiple moment design, the multiple source type design, and the multiple informant design respectively. In our discussion of previous research on the consequences of measurement error for mobility research, we will distinguish between these three designs. The pros and cons of each of them have been discussed in Section 1.5.1.

The *multiple moment design* has been used by Bielby and Hauser (1977) and Bielby, Hauser, and Featherman (1977a, 1977b, 1977c) in the United States. Part of their sample was re-interviewed three weeks after the first interview. The test-retest reliability coefficients of father's educational attainment and father's occupational status for non-blacks proved to be rather high: for father's education it is .94, while for father's occupational status it is .87. The authors conclude that the measurement error is random and that the reliability of background characteristics is as high as those of own characteristics. The inclusion of the measurement errors in linear structural models showed that the effect of father's occupational status is underestimated in research in which only one measurement moment is used, but that the effect of father's educational attainment is not biased. Bielby, Hauser, and Featherman (1977c) also looked at the consequences for the status attainment model of blacks. The reliability of their answers turned out to be lower than the reliability of whites, and errors turned out to be correlated. Allison and Hauser (1991) re-analysed the data of Bielby, Hauser and Featherman for non-blacks, using the multiple group option to deal with missing data (see also Section 2.4.2). The majority of results are similar to those of Bielby, Hauser and Featherman, except that in the analysis, the effect of parental income on occupational status is smaller after correcting for measurement error.

In the well-known Wisconsin panel study (Sewell and Hauser, 1980; Hauser, Tsai, and Sewell, 1983) respondents were interviewed in 1957, in 1964, and in 1975. Hauser, Tsai, and Sewell (1983) now reported lower reliabilities for father's educational attainment, mother's educational attainment, and father's occupational status (.68, .62, and .75 respectively). Their model also includes social-psychological variables. They found error in father's education to be correlated with error in father's occupation, but error in socioeconomic background was not related to respondent's educational or occupational attainment. Their model turns out to be more powerful in explaining educational attainment and occupational status than previous research without correction (Hauser, Tsai, and Sewell, 1983).

Hope, Schwartz, and Graham (1986) also used the multiple moment design. They re-interviewed ten percent of their original sample (in England and Wales) after two years. The reliability coefficients of father's education and father's occupational status were .72 and .76, respectively. The researchers concluded that unreliability leads to an underestimation of the relationship between father's and son's characteristics.

According to Breen and Jonsson (1997), who used data from a Swedish panel study in which questions about father's occupation and own occupation were repeated, the outcomes on the basis of the first wave do not differ from the results on the basis of the second wave. Using a loglinear model in which measurement error is incorporated by latent class analysis, they conclude that ignoring measurement error leads to an underestimation of inheritance effects.

In the *multiple source type design*, different *types* of sources are used, for example survey data and registered data. This design has never been used to estimate the reliability of father's educational attainment, as far as we know. This is because there are no sources available to look up this variable. In general, privacy regulations can be an enormous handicap for this design, and not many applications of the multiple source type design have been published.

Bowles (1972) was one of the first to investigate the consequences of measurement error in social background variables. He compared survey answers about father's occupation at age 16 with the information from the census closest to the year in which the respondent was 16 years old. The correlation was .74. Since he did not have census information about father's educational attainment, he assumed that the reliability of father's educational attainment was the same as that of father's occupational status. He concludes that measurement error leads to an underestimation of the effect of these variables on income and educational attainment.

Hauser, Tsai, and Sewell (1983) examined the reliability of father's occupational status in surveys (see above), using a concise description of father's occupation in tax records (Massagli and Hauser, 1983). This information has also been used by Massagli and Hauser (1983) who investigated father's occupation, parents' income, son's education, and son's occupation (the last two variables have not been measured with registered data). The bivariate correlations between these variables are underestimated if error is not incorporated in the model.

De Graaf, Poortman, and Ultee (1996) investigated the reliability of the respondent's occupation at the time of marriage (and of his or her spouse), by comparing the retrospective information with the occupations stated on the official marriage certificates. Note that these authors investigate the reliability of the measurement of the respondent's *own* occupation in the past, not the reliability of the measurement of father's occupation. The bias proved to be correlated and in the direction of the occupations of the respondent and his or her spouse at the time of the survey. As a consequence, it turned out that intragenerational mobility was underestimated.

Several investigators have used the *multiple informant design*. Broom, Jones, McDonnell and Duncan-Jones (1978) estimated the effects of father's educational attainment and occupational status on son's educational attainment and occupational status on two occasions: the first time they used only information obtained from sons and the second time they used only information obtained from fathers. The effects of social background on son's educational attainment and the effect of father's occupational status on son's occupational status are stronger in the second analysis. Since the two samples are independent (i.e., the fathers in the second analysis are not the fathers of the sons in the first analysis) it is not possible, with their data, to estimate a measurement model with two informants. Massagli and Hauser (1983) criticised Broom et al. (1978). They state that the way in which fathers were asked about the education and occupation of their sons differed from the way in which sons were asked about their own education and occupation.

Corcoran (1980; 1981) used interviews with young adults in 1976 whose parentshad been interviewed in 1968. It turned out that the offspring made answers on different parental characteristics more consistent than they really were. In general, adult children's reports were as reliable as those of their parents, except that the son's answer on mother's education was less reliable than the parental answer. Correcting for measurement error led to slight changes of parameter estimates: the effect of father's education on son's education became stronger, as did the effect of mother's education on daughter's education.

In their elaborated combination of different designs, Hauser, Tsai, and Sewell (1983) and Massagli et al. (1983) applied the multiple informant design, using information given by parents and siblings of the primary respondents. A disadvantage of their data is that parents were asked about the present occupation of their sons in 1964, while sons were asked about their present occupation in 1975 (Massagli et al., 1983).

Van Eijck (1996) used the multiple informant design, using part of the data also used in this study (Family Survey Dutch Population 1992). Van Eijck estimated models in which the information on family background characteristics originated from the primary respondent and from one randomly selected sibling. The effect of father's occupation on educational attainment was estimated to be slightly smaller in the multiple informant model, whereas the effect of father's educational attainment was slightly greater. In this chapter, we will replicate and extend Van Eijck's analysis, adding the more recent data collections of the Family Survey Dutch Population 1998 and 2000 to the 1992 survey.

Wolfle and Robertshaw (1983), Wolfle (1985), Wolfle and Ethington (1986), and Wolfle (1987) investigated the effects of family background on educational attainment for both black and white adolescents using replicate measurements of the parental characteristics, and sometimes using information provided by a parent. However, they only discuss the effects corrected for measurement error and do not compare uncorrected effects with corrected effects. The same applies to Hauser, Sheridan, and Warren (1999), Warren (2001), and Warren, Hauser, and Sheridan (2002), who corrected for measurement error in sibling

models, but only discuss the corrected estimates, without comparing them with uncorrected estimates. Fot this reason, their analyses will not be discussed here.

Mason, Hauser, Kerckhoff, Poss and Manton (1976) and Mare and Mason (1980, 1981) used information obtained from both black and white school-boys (grade 6 to 12) and from their parents. Since they investigate children instead of adults, their results will not be discussed here either.

2.3 Data and descriptives

2.3.1 Data

The data we analyze are from the repeated cross-sectional retrospective life-course surveys Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000). In these three surveys, primary respondents and their partners (married or unmarried) were interviewed in face-to-face interviews as well as being given self-completion questionnaires to fill out. Samples were drawn from the population registers from a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents, respectively (giving a total of 4,590 respondents).

Since many of the older respondents do not have any parents still living, and as we want to avoid the parental source addressing respondents in a different age range than the respondent and sibling sources, we included in the analysis only respondents of 54 years or younger. Of these respondents, 85.6 percent had at least one living parent at the time of the interview. In addition, about 89.5 percent of the respondents (in the 1992 and 2000 surveys[6]) reported having at least one living sibling. We have made a second age selection by excluding respondents under age 25, since many of the younger respondents had not completed their educational career at the time of the interview, and as a consequence did not yet have a steady occupation. These age selections leave us with a total of 3,138 respondents for whom we have valid respondent information on father's educational attainment and occupational status, and on respondent's educational attainment, occupational status, birth year, and sex.

Respondents were asked to give their parents' address and the address of one randomly selected sibling. The siblings and parents were then sent a questionnaire by mail, with a stamped return envelope. After two reminders, the second one again accompanied by the questionnaire and return envelope, completed parent questionnaires were received for 43.3 percent of the respondents with living parents. The response rate of siblings under

respondents with at least one living sibling was 39.4 percent. The non-response has two causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all questionnaires contain all information we want to include in our analysis: in 1998, parents were asked only about their education and not about their occupation at the time the primary respondent was 15 years old, and in all three questionnaires no questions were asked about deceased spouses of the surviving parent. This means that, although we have data on 3,138 respondents between 25 and 54 years old who answered the question about their father's education and occupation, we have parent reports on father's education for 897 respondents, and parent reports on father's occupation for 404 respondents. In addition, we have sibling reports on father's education and father's occupational status for 617 and 583 respondents respectively.

Highest level of completed education[7] of fathers and sons/daughters is the number of years necessary to complete the level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[8]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years. Occupational status of fathers and sons/daughters is coded according to the International Socio Economic Index (ISEI) scale, as constructed by Ganzeboom, De Graaf, and Treiman (1992).

In the status attainment models to be estimated, we will include sex and birth year as control variables. Although sex differences have decreased significantly, we expect to find that women attain lower levels of educational attainment and occupational status. We include birth year in the models too, because younger cohorts have attained higher levels of schooling. Both a cohort effect and an age effect lead to a negative effect of birth year on occupational status. Age has a positive effect on occupational status because of career development; this implies a negative effect of birth year. Moreover, it has been found that, when educational attainment is controlled for, younger cohorts attain lower levels of occupational status than older cohorts. The reason for this negative effect of birth year is the decreasing value of diplomas in the Netherlands. The average level of schooling has increased more sharply than the average level of occupations; this process is often labeled as diploma inflation (Wolbers, 1998).

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[6] In the 1998 survey, siblings were not questioned about their parents.
[7] The questions on all family background variables are presented in Appendix I.
[8] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.

2.3.2 Descriptives

In Table 2.1 we present basic descriptive information on the variables we use in the analysis. Father's educational attainment comes from three informants, and Table 2.1 reports on the similarities in the answers of three types of pairs: respondent-parent pairs (n=897), respondent-sibling pairs (n=617), and parent-sibling pairs (n=287). According to the 3,138 respondents in the analysis, the average education of their fathers is 9.27 years (including six years of primary education). The respondents for whom we have direct information from their parents reported a higher educational attainment for their father (average is 10.08 years). This

Table 2.1 Descriptive information about all variables in the analysis

		n	mean	s.d.	r	α
Father's educational attainment						
(in years: range 6–20)						.931
All respondents		3138	9.27	3.36		
Respondent-parent pairs:	respondent	897	**10.08**	3.40	.806	
	parent	897	**9.80**	3.55		
Respondent-sibling pairs:	respondent	617	9.37	3.39	.800	
	sibling	617	9.31	3.33		
Parent-sibling pairs:	parent	287	**9.56**	3.62	.847	
	sibling	287	**9.87**	3.53		
Father's occupational status						
(ISEI: range 10-90)						.927
All respondents		3138	44.76	16.28		
Respondent-parent pairs:	respondent	404	46.84	16.87	.781	
	parent	404	47.18	17.75		
Respondent-sibling pairs:	respondent	583	45.66	16.92	.788	
	sibling	583	46.52	17.13		
Parent-sibling pairs:	parent	240	46.77	17.32	.860	
	sibling	240	47.56	17.23		
Respondent's educational attainment						
(in years: range 6-20)		3138	11.59	3.23		
Respondent's occupational status						
(ISEI: range 10-88)		3138	49.76	16.02		
Female						
(male=0, female=1)		3138	.50			
Birth year						
(range 1938-1975; 1938=0, 1975=37)		3138	19.37	8.41		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (two-sided test).

α = Cronbach's alpha reliability coefficient based on the three correlations.

could be due to selective mortality and higher educated parents belonging to the younger birth cohorts. Moreover, among the parents still living, higher educated parents might have a higher response rate. Further, it turns out that parents on average have reported fewer years of education than their sons or daughters (respondents and their siblings) reported; these differences are significant ($p<.05$). The correlation of the answers of parents with those of the respondents is .806 and with the answers of siblings is .847. The fact that the parent-sibling correlation is higher than the parent-respondent correlation implies that the siblings in our analyses may be a more selective, and hence more motivated, subgroup that gives more reliable answers than the primary respondents. In the respondent-sibling pairs, the averages are about equal and the correlation between the answers is .800. Cronbach's alpha reliability coefficient of father's educational attainment is rather high, namely .931. Note that this is the reliability of the educational attainment if measured using three informants. The fact that this reliability is high does not mean that the individual items do not contain much error. However, the combination of these three items (each measured with error) leads to a highly reliable estimate of father's educational attainment.

Father's occupational status is reported to be slightly higher when there is a participating parent or sibling compared to in the whole age group 25-54. In general, however, neither interesting nor significant differences can be observed. The correlation coefficients within the three pairs of informants are .781, .788, and .860, and the overall reliability coefficient is .927. The descriptives of the other variables are reported for the sake of completeness.

2.4 Models

2.4.1 Approach to measurement error

We will estimate four linear structural models. These models are estimated using the LISREL software (Version 8.54), and accordingly we present the model parameters in compliance with the LISREL notation. The first (see Figure 2.1) is a model in which only information provided by primary respondents is used. In conventional research, this information is assumed to be measured without error. For that reason, we do not incorporate measurement error in Model 1.

In the second model, graphically represented by Figure 2.2, the information on father's educational attainment and occupational status comes from three informants: the primary respondent, a parent, and one randomly selected sibling. In the estimated models we can find answers to the question of whether correction for measurement errors leads to different estimates of the effects of family background on educational attainment and occupational status. Father's educational attainment and occupational status are treated as latent variables (η_1 and η_2) each with three indicators, Y_1, Y_2, Y_3, and Y_4, Y_5 and Y_6, respectively.

Figure 2.1 Model without measurement error

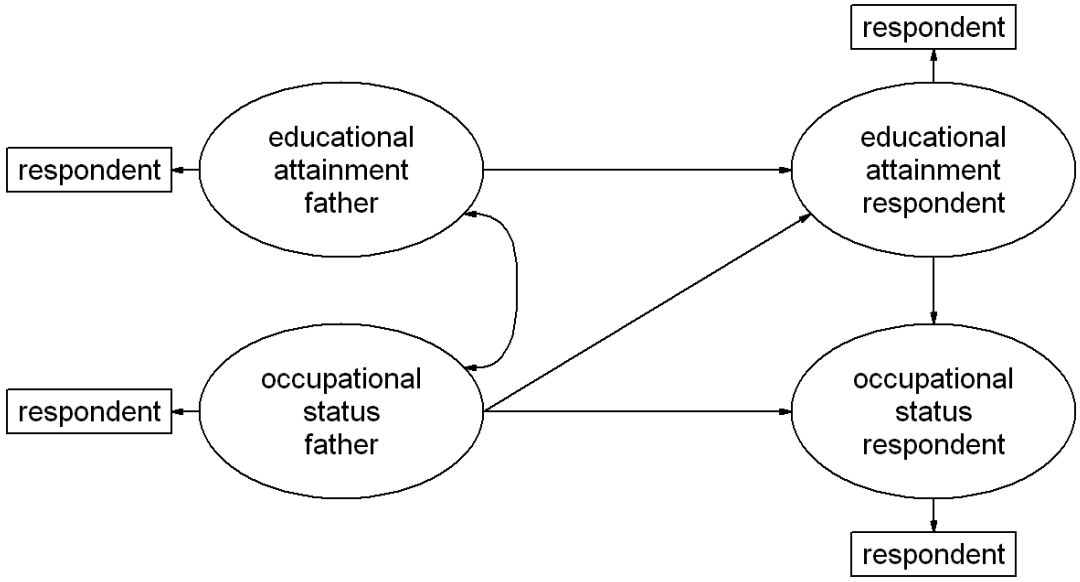
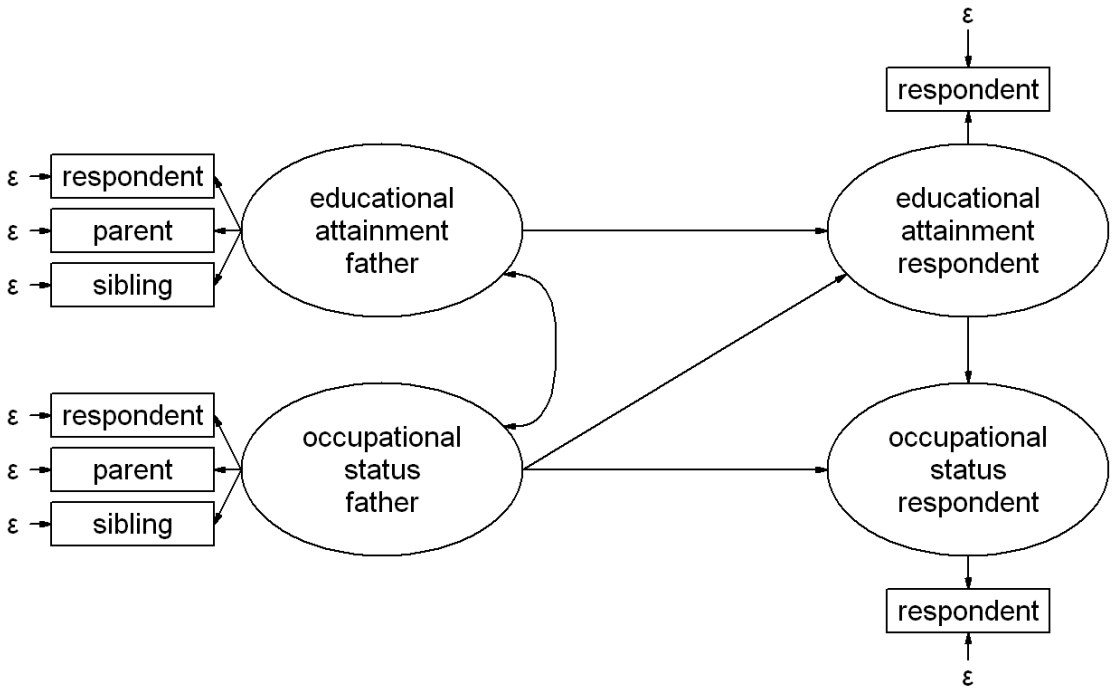


Figure 2.2 Model with random measurement error



Although the focus of this study is on measurement error in family background characteristics, we also take measurement error in the reports of respondent's own educational attainment and occupational status into account, since measurement error in these variables

can also affect the effects of family background. We have multiple measurements for these variables in the 2000 survey only, which implies that we cannot correct for measurement error in the full analysis. In the 2000 survey, the parents were asked about the educational attainment and occupational status of their children. On the basis of the correlations between the parental reports and the respondent reports, we fix the reliability of educational attainment to .85 and the reliability of occupational status to .80. This is in line with Hope, Schwartz, and Graham (1986), Hauser, Tsai, and Sewell (1983), and Bielby, Hauser, and Featherman (1977a, 1977b, 1977c), but Glebbeek (1993) finds a test-retest reliability of about .70 for occupational prestige. The reliabilities imply that about 15 and 20 percent respectively of the variance in educational attainment and occupational status is error variance (1-*r*). We computed the (unstandardized) error variances by hand (Hayduk, 1987), and included the estimates in the measurement model of the full analysis. In addition, we perform a sensitivity analysis by estimating the models fixing the error variance five percentage points higher and five percentage points lower. Further, we assume that respondent's birth year and sex are not subject to measurement error, since previous research showed that the reliability of these variables is very high (Schreiber, 1975/1976; Porst and Zeifang, 1987; Poulain, Riandey, and Firdion, 1992). The outcomes of this model will be compared with the effects of the status attainment model as estimated with the family background information reported by the 3,138 primary respondents only (Figure 2.1).

Figure 2.3 represents the correlated measurement error model. We will test whether respondent's report on father's educational attainment and father's occupational status is directly linked to the respondent's own educational attainment and occupational status. This would mean that there is some correlated measurement error. Furthermore, we will investigate whether respondents and siblings make father's education and father's occupation more consistent than they really are. These types of correlated measurement error will then be controlled for by the inclusion of error-covariances.

The fourth model (see Figure 2.4) uses only information provided by primary respondents. However, measurement error in their answers on their father's education and occupation, as estimated in Model 2 and Model 3, is incorporated. This is done in the same way as measurement error was incorporated into the respondent characteristics in Model 2 and Model 3. In this way we show that our information on measurement error can be used to correct for error if only respondent information is present.

We assess the model fit using three fit statistics: the Chi-square, the BIC, and the RMSEA. The Chi-square tests whether the model fit of the estimated model deviates from the saturated model. A significant Chi-square test that the model fit is significantly worse than that of the saturated model. A disadvantage of the Chi-square is that it is likely to become significant when the sample size is large. Therefore, the BIC (= Bayesian Information Criterion, Raftery, 1993, 1995) takes the number of cases into account. A negative BIC value means that the model is a better representation of the data than the saturated model. For large

Figure 2.3 Model with correlated measurement error

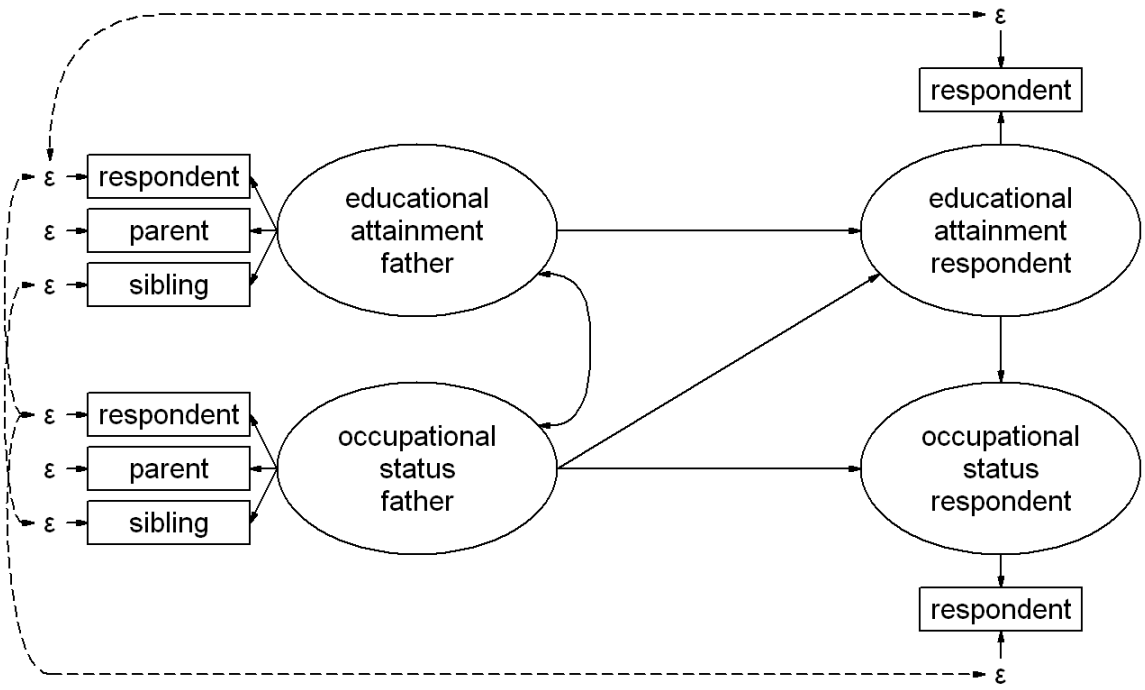
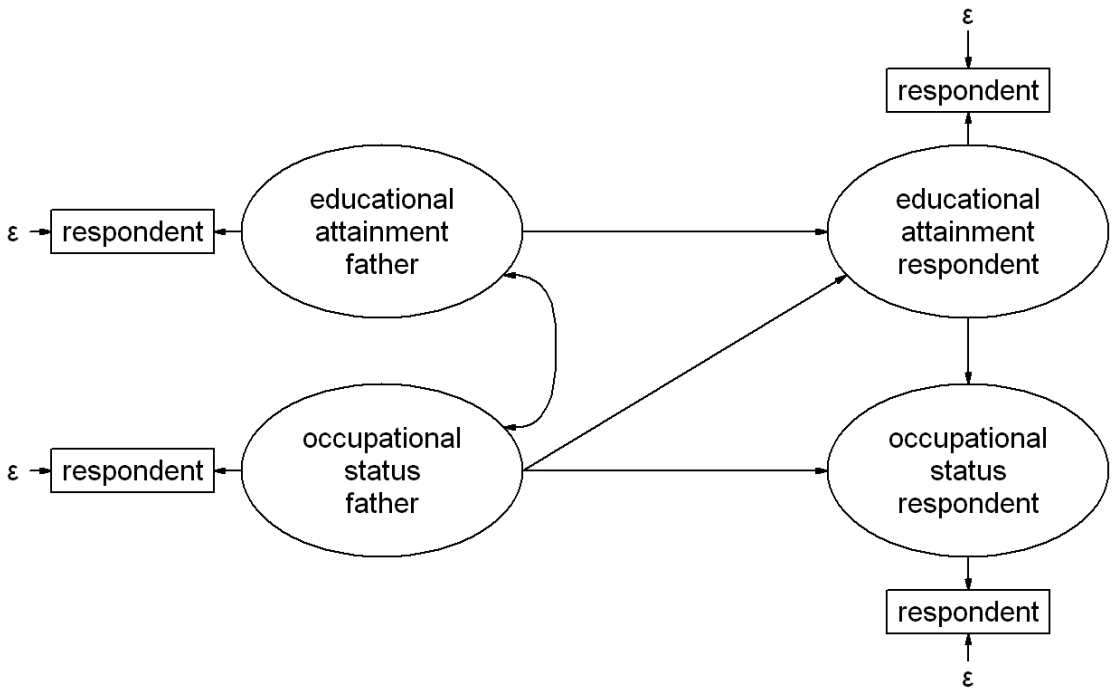


Figure 2.4 Model with imputed measurement error



models, estimating more effects (and hence losing degrees of freedom) is less likely to improve the BIC value although it could improve the Chi-square statistic. The RMSEA (Root Mean Square Error of Approximation) is the average error per degree of freedom and takes the sample size into account as well. A value below .05 is usually considered to imply a good fit (Browne and Cudeck, 1993).

2.4.2 Approach to missing values

As noted above, we do not have complete information for all respondents. Table 2.2 gives additional information on the missing value structure in our data. We distinguish between five groups. Respondents for whom we have information on father's education and father's occupation from all three informants are in Group A (n=226). The other four groups have at least one missing informant. In Group B (n=161) there is no sibling information, and in group C (n=336) there is no parent information. In Group D we rank 464 respondents for whom we do not have sibling information and no parent information on father's occupation (mainly respondents from the 1998 survey). The largest category is Group E with 1,951 respondents for whom we have no other informants than the primary respondents[9].

Table 2.2 Missing value structure: sample size of five subgroups

Group	Father's education and occupation according to primary respondent	Father's education according to parents	Father's occupation according to parents	Father's education and occupation according to sibling	n
A	known	known	known	known	226
B	known	known	known	missing	161
C	known	missing	missing	known	336
D	known	known	missing	missing	464
E	known	missing	missing	missing	1951
Total					3138

In the LISREL software it is possible to include all five groups in a single analysis, since one latent variable can be measured by different numbers of indicators over groups of respondents, using the multiple-group option in the LISREL software. If there is no parent or sibling report on a given family background variable, the mean and the covariances of that

[9] The covariance and means matrices for the five groups are shown in Appendix II.

indicator with all other variables in the analysis are set to zero, while the variance is set to one. In addition, the effect of the latent variable on this indicator is set to zero (Jöreskog and Sörbom, 1996). Further, the regression effects are restricted to be equal over the five groups[10]. The means of the indicators (if they are not missing) in the different groups have to be restricted to be equal, if the data are missing at random (MAR) instead of missing completely at random (MCAR). Possible differences between the groups are not worrying, since this method gives reliable results if data are either MAR or MCAR (Allison, 1987). Still, these differences do deteriorate the fit statistics. Since these fit statistics test at the same time whether the model fits the data well and whether missing values are MAR instead of MCAR, we also provide the fit statistic for the model where the means are not restricted to be equal. Note that in Group E, in which we have included the respondents for whom we do not have additional family background information from a parent or a sibling, the estimated effects are also corrected for measurement error, since the errors are restricted to be equal to those in the group of the respondents for whom we do have information from parents or siblings. For more information about the treatment of missing values, see Section 1.5.4.

2.5 Model 1: No measurement error

Model 1 in Table 2.3 is the baseline model of our analysis. This model uses only the primary respondent as informant for father's educational attainment and father's occupational status. In other words, this linear structural model is the same model as estimated by ordinary least square regression analysis. The difference is that the LISREL approach presents goodness of fit statistics. The Chi-square is 5.884 with 3 degrees of freedom, which refer to the relations between female and father's educational attainment and occupational status and the effect of father's educational attainment on respondent's occupational status. These relations were restricted to be zero, since we found these relations to be empirically absent as well as theoretically not justified. The model fits the data well, according to the Chi-square, the BIC, and the RMSEA.

The model estimates, as reported in Table 2.3, show that, in line with previous research, father's educational attainment and father's occupational status have a positive effect on son's and daughter's educational attainment. The effect of father's educational attainment is much

[10] In addition, the number of degrees of freedom as computed by LISREL must be corrected. The real number of degrees of freedom is 110 lower than computed, because 110 is the total number of values set to zero or one in the covariance and means matrices of the five groups (Jöreskog and Sörbom, 1996).

Table 2.3 Effects of social background, female, and cohort on respondent's educational attainment and occupational status

	Model 1 no measurement error			Model 2 random measurement error			Model 3 correlated measurement error			Model 4 imputed measurement error		
	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
Effects on educational attainment												
Father's educational attainment (6-20)	**.300**	.020	.311	**.444**	.043	.440	**.412**	.050	.408	**.440**	.045	.436
Father's occupational status (10-90)	**.025**	.004	.127	.010	.009	.046	.015	.010	.068	.012	.010	.055
Female (male=0, female=1)	**-.536**	.104	-.083	**-.540**	.104	-.091	**-.537**	.104	-.090	**-.537**	.104	-.090
Birth year (1938=0, 1975=37)	**.031**	.006	.080	**.022**	.007	.061	**.024**	.007	.066	**.023**	.007	.066
R square	.183			.250			.239			.254		
Effects on occupational status												
Father's occupational status (10-90)	**.141**	.015	.143	**.148**	.021	.145	**.142**	.026	.139	**.145**	.022	.142
Respondent's educational attainment (6-20)	**2.476**	.078	.499	**2.910**	.100	.605	**2.927**	.103	.608	**2.912**	.101	.605
Female (male=0, female=1)	**-1.889**	.475	-.059	**-1.640**	.479	-.057	**-1.648**	.479	-.057	**-1.612**	.479	-.056
Birth year (1937=0, 1975=38)	**-.112**	.028	-.059	**-.136**	.029	-.080	**-.137**	.029	-.080	**-.136**	.029	-.080
R square	.318			.455			.455			.455		
Chi-square	5.884			513.826		*211.779*	508.782		*207.220*	7.984		
df	3			177		*148*	173		*144*	3		
RMSEA	.018			.025		*.012*	.026		*.012*	.023		
BIC	-24			-911.261		*-979.819*	-884.100		*-952.173*	-16.170		
n	3138			3138			3138			3138		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).
Fit statistics in italics belong to a model in which the means of the indicators in the different subgroups are allowed to differ.

The model estimates, as reported in Table 2.3, show that, in line with previous research, father's educational attainment and father's occupational status have a positive effect on son's and daughter's educational attainment. The effect of father's educational attainment is muchstronger than the effect of father's occupational status. The educational attainment of women is lower than that of men and younger birth cohorts attained a higher level of education.

Father's occupational status and son's or daughter's educational attainment have a positive effect on the respondent's occupational status. As expected, the effect of educational attainment is much stronger than the effect of father's occupational status. Previous research found a somewhat stronger effect of educational attainment on occupational status than .499. De Graaf (1987) found a standardized effect of .57 for the Netherlands, while Blau and Duncan (1967) found a standardized effect of .52 for the United States. The difference might be explained by the fact that they analyzed only sons, while we analyze both sons and daughters. For women in the Netherlands, the effect of education on occupational status might be lower due to the fact that they often have part-time jobs. If we perform our analysis for sons only, we find a standardized effect of .520, while an analysis for daughters only yields a standardized effect of .476. Furthermore, Table 2.3 shows that women have a lower occupational status than men. The younger birth cohorts have a lower occupational status than the older cohorts (after controlling for educational attainment), which is a replication of the findings of Wolbers (1998).

The conclusion is that achievement plays a much more important role in the Dutch labor market than ascription, although it must be recognized that educational attainment functions as an important channel of intergenerational transmission of socio-economic status.

2.6 Model 2: Random measurement error

Model 2 in Table 2.3 allows for random measurement error. The fit statistics provide ambivalent information about the model fit. The Chi-square is significant (for both the model with and without the restriction of equal means across missing value groups). However, this might be due to the large sample size. The BIC value is negative and the RMSEA is below .05. We conclude that the model fit is satisfactory.

Table 2.3 shows that there are differences in the parameters of the status attainment model after measurement error has been taken into account. In Model 2 the standardized effect of father's educational attainment on respondent's educational attainment is 41 percent greater than the effect in the baseline model, and the standardized effect of father's occupational status on respondent's educational attainment is 64 percent smaller and has become statistically insignificant. The difference in the effect of father's educational attainment is statistically significant, while the difference in the effect of father's occupational

status is on the borderline of significance ($p < .07$) for a two-sided test[11]. It is important to note that the correlation between father's education and father's occupation in the model with measurement error is 31 percent larger (.764 instead of .584, not shown in Table 2.3) greater than in the baseline model. We conclude that the effect of father's occupational status on respondent's educational attainment is smaller due to the fact that the effect of father's education on respondent's education and the correlation between father's education and father's occupation are greater. If measurement error is not included in the model, father's educational attainment is not completely represented by the measurement of father's educational attainment. Part of father's educational attainment is presumably represented by father's occupational status, which results in father's occupational status having a significant effect on son's/daughter's educational attainment.

Table 2.3 further shows that the standardized effect of respondent's educational attainment on respondent's occupational status, which is already very strong in Model 1, is 21 percent greater when measurement error is incorporated in the model. This difference in effect is statistically significant ($p<.05$). The unstandardized effect of father's occupational status on respondent's occupational status has hardly changed. Apparently, the status attainment process in the Netherlands is even more education-driven than earlier research has shown. Status is inherited through educational paths: father's education rather than father's occupation affects children's educational attainment, and the effect of education on occupation is stronger than models without control for measurement error suggest.

We investigated whether different error-variances in the respondent characteristics would lead to different results. Analyses were performed in which proportions of error-variance were fixed 5 percentage points lower (i.e., .10 and .15 for educational attainment and occupational status, respectively) and 5 percentage points higher (i.e., .20 and .25, respectively). Neither of these analyses yielded different conclusions.

2.7 Model 3: Correlated measurement error

In this section, we focus on correlated measurement error. Correlated measurement errors are measurement errors that are related to characteristics of respondents or their parents. In Table 2.4 we present a regression analysis in which the answers of primary respondents about their father's educational attainment and occupational status are predicted by (i) the information the parents have provided about the educational attainment and occupational status, (ii) the corresponding characteristic (education or occupation) of the respondents themselves, and (iii) the other characteristic of the father. If there were no correlated bias related to the

[11] We computed the significance with the formula: $T = (b_1 - b_2)/\sqrt{(se_2^2 - se_1^2(se\varepsilon_2^2/se\varepsilon_1^2)}$), where b_1 and b_2 are the unstandardized regression coefficients, se_1 and se_2 are the standard error of the regression coefficients, and $se\varepsilon_1^2$ and $se\varepsilon_2^2$ are the unexplained variances in the dependent variables (Clogg, Petkova, and Haritou, 1995).

respondent's socio-economic attainment, the characteristics of the respondents would not have any effect on the information they give about their fathers.

Table 2.4 Bias of reported father's educational attainment and father's occupational status toward characteristics of the respondent and the father

		Father's educational attainment according to respondent			Father's occupational status according to respondent		
Source	Variable	b	s.e.	beta	b	s.e.	beta
Parent	Father's educational attainment (6-20)	**.670**	.025	.698			
Parent	Father's occupational status (10-90)				**.601**	.039	.632
Respondent	Father's educational attainment (6-20)				**.942**	.197	.192
Respondent	Father's occupational status (10-90)	**.032**	.005	.156			
Respondent's educational attainment (6-20)		.024	.023	.022			
Respondent's occupational status (10-90)					**.063**	.034	.060
R square (adjusted)		.664			.633		
n		897			404		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

Table 2.4 suggests that correlated measurement error is present. Respondent's answer about father's occupational status has a positive and significant effect on the information he or she has given about father's educational attainment, and respondent's report on father's educational attainment has a significantly positive effect on the answer he or she has given about father's occupational status. Furthermore, there is a direct effect of respondent's own occupational status on father's occupational status as reported by the respondent. This suggests that the answers given by respondents about the socio-economic status and education of their father are biased, in the direction of their own socio-economic status. Nevertheless, this is not the ultimate test for measurement error, since answers of parents are not necessarily correct. To perform a better test of correlated measurement error and to correct for this type of measurement error, in Model 3 we allowed the errors in respondent's and sibling's answers on father's educational attainment and occupational status to correlate. Furthermore, we allowed the error in respondent's information on father's educational attainment and occupation to be correlated with the errors in respondent's answers on own educational attainment and occupation respectively. Table 2.5 shows the error-covariance between father's educational attainment and father's occupational status. Neither in the information provided by

respondents, nor in the information provided by siblings is the error-covariance significant; the error-covariance for respondent information does not even have a positive sign. The same applies to the bias in respondent reports on father's educational attainment and father's occupational status towards respondent's educational attainment and occupational status, respectively, as presented in Table 2.6.

Table 2.5 Correlation between errors in answers on different family background variables

	covariance	s.e.	correlation
Respondent information:			
Father's educational attainment and father's occupational status	-.087	.605	-.002
Sibling information:			
Father's educational attainment and father's occupational status	.898	.751	.016

Table 2.6 Correlation between errors in answers of respondents about their father and about themselves

	covariance	s.e.	correlation
Father's and respondent's educational attainment	.185	.136	.017
Father's and respondent's occupational status	2.395	3.566	.009

The fit statistics for Model 3 in Table 2.3 are similar to those of Model 2. The difference in Chi-square is not significant. Furthermore, correlated measurement error does not result in different estimates of the structural effects in the status attainment model.

Fixing the proportions of error-variance in respondent's educational attainment and occupational status 5 percentage points lower does not lead to different results. However, if the measurement error in son's/daughter's educational attainment is set to 20% instead of 15%, i.e., 5 percentage points higher than could reasonably be expected, the effect of father's occupational status on son's/daughter's educational attainment becomes significant again ($p < .05$, for a one-sided test).

2.8 Model 4: Imputed measurement error

In the previous sections we found that the error variance in both father's occupational status and father's educational attainment is rather substantial and affects the estimates of the status process in the Netherlands in important ways. Therefore, we recommend including our estimates of the error variances in future research. Based on the 2000 Family Survey Dutch Population, we found that for primary respondents the error variance in educational attainment and occupational status is about 15 and 20 percent, respectively. The effects of the latent father characteristics on their indicators (the LY in LISREL terms) are shown in Table 2.7. It turns out that the effects on the paternal answers (.914 and .917 for father's educational attainment and father's occupational status, respectively) are significantly stronger than those on the answers of primary respondents (.879 and .860 respectively). The square of the standardized effect refers to the reliability. Table 2.8 presents the error-variance in the information provided by the three informants as a proportion of the total variance. The information provided by primary respondents is less reliable than those by parents and siblings, possibly because parents and siblings are a more selective subgroup. The error proportions for primary respondents are about .25.

Table 2.7 The effects of latent paternal characteristics on their indicators

	Indicator respondent			Indicator parent			Indicator sibling		
	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized
Father's educational attainment	1.000	- -	.879	1.094	.028	.914	1.018	.031	.905
Father's occupational status	1.000	- -	.860	1.128	.039	.917	1.096	.035	.912

Note: The effects of the latent variables on the respondent-indicators are set to one.

Table 2.8 The proportion of indicator error variance

	Indicator respondent	Indicator parent	Indicator sibling
Father's educational attainment	.227	.165	.182
Father's occupational status	.260	.159	.169

In Model 4 of Table 2.3, we imputed these proportions of error variance in Model 1, that is the model with information by the respondents only. The Chi-square is now significant due to the fact that father's educational attainment now has a significantly negative effect on son's and daughter's occupational status, which is restricted to be zero in the model. The test is whether Model 4 produces the same effects as Model 2 and Model 3, and this indeed appears to be the case. The estimates of Model 4 show (i) that father's education has a strong effect on respondent's educational attainment, stronger than a model without correction suggests, (ii) that in contrast to what previous research concluded, there is no effect of father's occupation on respondent's educational attainment, (iii) that the effect of father's occupation on respondent's occupation is not affected by measurement error, and (iv) that the effect of respondent's educational attainment on occupational status is greater than a model without controls for measurement error would suggest. Thus, Model 4 with the imputed error variances reaches exactly the same conclusions as the models with explicit controls for measurement error. Modeling about 25 percent error variance in social background indicators and 15 and 20 percent in educational and occupational achievement respectively, consideravly changes our view on the status attainment process in the Netherlands.

2.9 Conclusion and discussion

In this chapter we have estimated models for random and correlated measurement error in the status attainment model for the Netherlands, using information on family background from three informants: the respondent, one of his/her parents, and one of his/her siblings.

We have found that the results based on the measurement error models deviate in several ways from earlier findings with respect to the status attainment process in the Netherlands. First, we found that the model that controls for random measurement error leads to a non-significant effect of father's occupational status on his children's educational attainment, and to a greater effect of father's educational attainment on his children's education. This is in line with earlier conclusions, that in the Netherlands the cultural dimension of social inequality is stronger for status attainment process than the economic dimension, although it is surprising that the effect of father's occupation on children's educational attainment disappears completely in models in which measurement error is controlled for. Assuming that father's occupational status represents the economic dimension of family background and father's educational attainment represents the cultural dimension, we now must conclude that the family of origin's economic resources do not play a role in the Dutch educational system. In Chapter 4, we will investigate the effects of cultural and economic resources more directly by looking at cultural consumption and material possessions of the parents. A second important conclusion is that in the Netherlands the effect of educational attainment on occupational status is stronger than models without correction

for random measurement error suggest. We did not find further evidence that the information respondents provide about father's occupational status and father's educational attainment is systematically biased in the direction of their own occupational status and educational attainment. In addition, controls for correlated error do not lead to different estimates of the effects of the status attainment model.

We have shown that the correct path coefficients can be estimated by imputing explicit values of the error variances in the status attainment model. The error variances in both father's educational attainment and father's occupational status must be constrained to be about 25 percent of the original variances, and the error variances in respondent's educational attainment and occupational status must be constrained to be 15 and 20 percent, respectively, of the original variances. When these error variances are imputed in the model, the model estimates are very similar to those we found in the multiple-informant model. We have made clear that this has consequences for conclusions about the status attainment process in the Netherlands, especially since not only the absolute size, but also the relative size of the effects are different in a model with controls for measurement error. After taking measurement error into account, the role of father's educational attainment is more important, especially compared to the role of father's occupational status.

Chapter 3: Historical changes in educational and occupational mobility

Summary

In this chapter we investigate whether trends in the effects of family background in status attainment models are biased when conventional retrospective measurement of family background is used. It turns out that the trend towards more openness in the Netherlands, i.e., a declining influence of father's educational attainment on son's/daughter's educational attainment, a declining influence of father's occupational status on son's/daughter's occupational status, and an increasing influence of son's/daughter's educational attainment on son's/daughter's occupational status, is slightly stronger if measurement error is included in the model. However, the differences in trends between models with and without error correction are not significant.

3.1 Introduction and previous research

In the previous chapter we investigated the consequences of measurement error for the estimates of the status attainment model, especially for the effects of family background on educational and occupational attainment. We found that the measurement error in both father's educational attainment and father's occupational status is random and not correlated, and that it accounts for 22.7 and 26.0 percent of the total variance of these variables, respectively. Correcting the effects of family background for measurement error results in:

(a) a considerably stronger effect of father's educational attainment on children's educational attainment: the effect is 41 percent stronger;
(b) an insignificant effect of father's occupational status on children's educational attainment;
(c) no change in the direct effect of father's occupational status on children's occupational status;
(d) a stronger effect of educational attainment on occupational status: the effect is 21 percent stronger.

The corrected estimates lead to new conclusions about the status attainment process in the Netherlands. In this chapter we set out to investigate whether controlling for measurement error in family background, using the error estimates of the previous chapter, also leads to new conclusions about historical changes in the status attainment process. We do this by performing a cohort analysis, applying information about the size and character of measurement error found in the previous chapter. Using the repeated cross-sectional surveys Family Survey Dutch Population 1992, 1998, 2000, and 2003, with data on 6,414 respondents, we will first perform a conventional cohort comparison without correcting for

measurement error. We expect that this cohort comparison will produce the familiar findings for the Netherlands, as discussed in the next paragraphs: a decrease in the effect of family background on educational attainment, a decrease in the direct effect of family background on occupational status, and a more or less stable effect of educational attainment on occupational status. After this replication, we adjust the effects of the status attainment model by including the estimates of the measurement errors in the variables.

The conventional estimates of the status attainment model are well established in the existing research literature:

(a,b) the effect of family background on educational attainment:

De Graaf and Ganzeboom (1990) used data collected between 1970 and 1986 with respondents born in the period 1891-1960. Their loglinear analysis of the bivariate relationship between father's and both son's and daughter's educational attainment showed a strong decline in this relationship over birth cohorts. An ordinary least squares (OLS) regression analysis, employing mainly the same data, showed that the effects of both father's education and father's occupational status have decreased over cohorts (De Graaf and Ganzeboom, 1993). These OLS results have been replicated by De Graaf and Luijkx (1995) and by Ganzeboom (1996). Ganzeboom and Luijkx (2004) used loglinear models to investigate the trend in the effect of father's occupational class on son's and daughter's educational attainment with data collected in the period 1970-1999. Again, it turned out that this effect declined. Summing up then, both loglinear analysis and OLS regression analysis lead to the same conclusion: The effect of family background on children's educational attainment has declined in the Netherlands.

(c) the direct effect of family background on occupational status/class:

Loglinear analysis of the bivariate relationship between father's and children's occupational class has shown that this relationship has decreased (Ganzeboom and De Graaf, 1984; Ganzeboom and Luijkx, 1995; Ganzeboom and Luijkx, 2004). Ganzeboom and Luijkx (2004) also made clear that the direct effect of father's occupational class, controlling for son's/daughter's educational attainment, has declined for both men and women. Using OLS regression analysis, De Graaf and Luijkx (1993) showed that the direct effect of father's occupational status on children's occupational status has declined for labor-market cohorts 1929 through 1980, both for men and women.

(d) the effect of educational attainment on occupational status/class:

Not much change has been found in this effect in the Netherlands. De Graaf and Luijkx (1993; 1995), employing OLS regression models, found that the effect of schooling has increased slightly over birth cohorts for men, but that it has decreased for women. According to Ganzeboom and Luijkx (2004), who used loglinear analysis, the effect of educational attainment on occupational class has decreased both for men and for women. This decrease has come to an end and the effect of schooling on occupational status has currently stabilized.

In this chapter we will investigate whether these trends can be replicated with the data from the Family Surveys Dutch Population 1992-2003, and whether correcting for measurement error will lead to different conclusions. We assume that the size of the measurement error is the same for all cohorts. However, we cannot test this since we do not have enough information provided by multiple informants in the older cohorts. The correction for measurement error may affect the size of the trend, but it is difficult to predict beforehand how the trends will change.

A problem with cohort analyses of occupational status using cross-sectional data is that one cannot distinguish between age effect and cohort effect (see Section 3.3). Consequently, we also look at occupational status at age 25. In analyses with occupational status at age 25, no age effect is present, since occupational status is measured at the same age for all respondents.

3.2 Data and descriptives

3.2.1 Data

We analyze the repeated cross-sectional retrospective life-course survey Family Survey Dutch Population 1992, 1998, 2000 and 2003[12] (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000, 2003). Primary respondents and their (married or unmarried) partners were interviewed in face-to-face interviews and were asked to fill out self-completion questionnaires in these three surveys. Samples were drawn from the population registers of a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, 40.6 percent in 2000 and 52.6 percent in 2003. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,800[13], 2,029, 1,561, and 2,174 respondents respectively (giving 7,564 respondents in total).

We have made an age selection by excluding respondents under age 25, since many of the younger respondents had not completed their educational career at the time of the interview, and as a consequence do not yet have a steady occupation. In addition, people born before 1925 were excluded, since their number was too small to constitute a separate cohort. These selections leave us with a total of 7,113 respondents. We left out cases with missing values listwise. Since about 10 percent of the respondents did not have valid scores on all variables in the analysis, the analyzed sample is 6,414 respondents.

[12] In contrast to the Chapters 2, 4, 5, 6, and 7, we also use the 2003 survey, since in this chapter we do not need the answers of parents or siblings on family background (which are not present in the 2003 survey).
[13] In contrast to the Chapters 2, 4, 5, 6, and 7, we use all 1,800 respondents of the 1992 survey. In the other chapters we could not use information on the partners of the primary respondents, since the partner was not asked to give the names and addresses of the parents and siblings.

Highest completed education[14] is measured as the number of years necessary to complete the highest level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[15]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years. Educational attainment at age 25 has been constructed on the basis of the educational career; for each education that the respondent followed, the completion date and whether the respondent obtained a diploma was asked.

Current/last occupation was asked directly to the respondent. Furthermore, respondents were asked to list all occupations they had had and, for each occupation, to note the year and month in which the job started. With this information, the occupation at the age of 25 was assessed. Occupational status is coded according to the International Socio Economic Index (ISEI) scale, as constructed by Ganzeboom, De Graaf, and Treiman (1992).

Furthermore, we have constructed 11 birth cohorts[16] each addressing a period of five years, and together referring to the period 1925 to 1979.

In the status attainment models to be estimated we will include sex and age as control variables. We expect to find that women attain lower levels of educational attainment and occupational status and that these sex differences have decreased significantly over cohorts. We include age in the models too because age has a positive effect on occupational status due to career development.

3.2.2 Descriptives

Table 3.1 gives descriptive information of all variables used, for each of the 11 birth cohorts (1925-1979) separately and for the total sample. Note that the oldest and the youngest cohorts are very small in size, so our conclusions about trends are mainly based on the birth cohorts 1930 to 1974. Since we perform the analyses on occupational attainment separately for the current/last occupational status and the occupational status at the age of 25, and because the latter has more missing values than the former, we present the descriptive information of the variables both for those cases with a valid score for current/last status and for status at age 25.

[14] The questions on all family background variables are presented in Appendix I.
[15] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.
[16] The covariance matrices for the cohorts are presented in Appendix II.

Table 3.1 Descriptive information per birth cohort

Selection on the basis of valid score for current/last occupation

		Educational attainment father range (6-20)		Occupational status father range (10-90)		Educational attainment range (6-20)		Occupational status range (10-90)		Female (0-1)	Age range (25-84)	
Cohort	n	mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	std. dev.	mean	mean	std. dev.
1925-1929	108	7.66	2.85	40.69	15.71	9.83	3.53	45.92	16.76	.40	67.89	3.75
1930-1934	348	8.16	3.05	41.35	16.87	10.15	3.48	47.12	16.43	.42	65.12	3.85
1935-1939	467	7.99	2.99	40.03	14.99	10.05	3.49	46.40	16.51	.46	60.43	4.29
1940-1944	570	8.36	3.05	41.66	15.87	10.60	3.34	47.83	16.44	.46	55.34	4.18
1945-1949	784	8.66	3.18	43.34	15.88	10.84	3.46	49.08	16.10	.50	50.71	4.11
1950-1954	812	8.89	3.25	43.04	16.25	11.17	3.32	49.27	16.25	.49	45.54	4.26
1955-1959	930	9.17	3.39	44.88	16.82	11.73	3.29	50.58	15.79	.50	40.61	4.11
1960-1964	973	9.40	3.20	44.32	15.48	11.75	3.11	48.71	15.69	.49	36.29	3.95
1965-1969	804	9.80	3.15	44.57	15.43	11.80	2.97	48.73	15.76	.53	32.25	3.43
1970-1974	448	10.40	3.11	46.53	16.00	12.29	2.89	50.40	16.24	.53	29.13	2.41
1975-1979	142	10.75	3.06	46.11	16.58	12.01	2.82	49.72	15.50	.58	26.58	1.14
Total	6414	9.07	3.25	43.59	16.05	11.26	3.32	48.89	16.11	.49	44.35	11.85

Table 3.1 continued

Selection on the basis of valid score for occupation at age 25

Cohort	n	Educational attainment father range (6-20) mean	Educational attainment father range (6-20) std. dev.	Occupational status father range (10-90) mean	Occupational status father range (10-90) std. dev.	Educational attainment at age 25 range (6-20) mean	Educational attainment at age 25 range (6-20) std. dev.	Occupational status at age 25 range (10-90) mean	Occupational status at age 25 range (10-90) std. dev.	Female (0-1) mean	Age range (25-84) mean	Age range (25-84) std. dev.
1925-1929	101	7.42	2.59	39.43	14.68	9.02	2.65	43.02	14.73	.39	67.91	3.77
1930-1934	318	8.03	3.97	41.15	16.74	9.42	2.93	43.38	14.50	.42	65.14	3.85
1935-1939	429	7.76	2.72	39.35	14.57	9.45	2.91	43.90	15.77	.48	60.38	4.26
1940-1944	535	8.22	2.95	41.17	15.75	9.86	2.70	44.89	14.64	.47	55.38	4.18
1945-1949	716	8.47	2.98	42.68	15.42	9.97	2.87	45.61	14.52	.53	50.64	4.13
1950-1954	737	8.63	3.04	42.16	15.87	10.27	2.75	46.64	14.34	.51	45.50	4.26
1955-1959	804	8.81	3.11	43.53	16.03	10.73	2.53	46.50	14.91	.53	40.57	4.14
1960-1964	851	9.15	3.03	43.49	15.21	10.85	2.48	46.12	13.80	.50	36.25	3.94
1965-1969	706	9.58	2.95	43.53	14.95	11.18	2.48	45.49	14.51	.53	32.14	3.45
1970-1974	390	10.28	3.02	45.55	15.40	11.62	2.42	46.30	14.72	.54	29.02	2.44
1975-1979	131	10.65	2.92	45.05	15.97	11.64	2.56	48.98	14.36	.59	26.56	1.16
Total	5719	8.83	3.07	42.68	15.59	10.44	2.74	45.69	14.61	.51	44.51	11.89

Concerning father's educational attainment, it can be assessed from Table 3.1 that this increases over birth cohorts. This is a result of educational expansion.

Looking at respondent's own educational attainment, we observe educational expansion as well. Note that the average of the highest completed education for the last cohort is slightly lower than that for the 1970-1974 cohort. This could be due to sample fluctuation and may be the result of the small size of the last cohort or due to the fact that some born in the last cohort have not completed their education yet. Furthermore, the average highest completed education (11.26) is somewhat higher than the average of educational attainment at age 25 (10.44). This is partly due to the fact that some people have not yet completed their educational career at age 25 and partly due to the fact that the group of people who have not yet had an occupation at age 25 are higher educated. In all cohorts, son's/daughter's educational attainment is higher than father's educational attainment; another consequence of educational expansion.

Father's occupational status also increases over birth cohorts. Son's/daughter's occupational status increases up to the 1955-1959 cohort. After that cohort, we observe a stabilization or even a decrease. This stabilization is present for both current/last occupational status and occupational status at age 25. Therefore, it cannot be attributed completely to the fact that persons in the younger birth cohorts are younger and are not yet at the peak of their career.

The proportion of women changes over the birth cohorts. In the oldest birth cohorts, women are underrepresented. This is due to the fact that we only included people who have had an occupation during their lifetime. Many women in the oldest birth cohorts have never had a paid occupation in their lives. In the youngest birth-cohorts, women are overrepresented, which might be due to a higher response among women. In the total sample, men and women are about equally represented.

Age is highly related to birth cohort, due to the fact that the survey years (1992, 1998, 2000, and 2003) are close together.

3.3 Models

We analyze the bias due to measurement error in the effects of family background on educational attainment, current/last occupational status, and occupational status at age 25 with path models, making use of the LISREL (version 8.54) software (Jöreskog and Sörbom, 1996). Further, we allow the effects of being female, father's educational attainment, and father's occupational status on son's/daughter's educational attainment to differ over cohorts, using the multiple group option in LISREL (both with and without a linear restriction). The effects of being female, father's occupational status, and son's/daughter's educational

attainment on son's/daughter's occupational status are allowed to differ over birth cohorts as well.

Since we use cross-sectional data, we cannot disentangle the effect of age and the effect of cohort. Analyzing both the interactions between cohort and family background/female and the interactions between age and family background/female together is not possible since the relation between age and cohort is too strong. This is problematic since both age and cohort are assumed to interact with the effect of social background. The effect of social background decreases with age (just as the effect of educational attainment on occupational status). This means that a decrease of the effect of family background over cohorts could be suppressed due to the decrease in the effect over age. For the effects of social background on educational attainment, this is not much of a problem, since most people have completed their educational career by the age of 25. Therefore, researchers of educational attainment (De Graaf and Ganzeboom, 1990; De Graaf and Ganzeboom, 1993) restrict their analyses to people over 25.

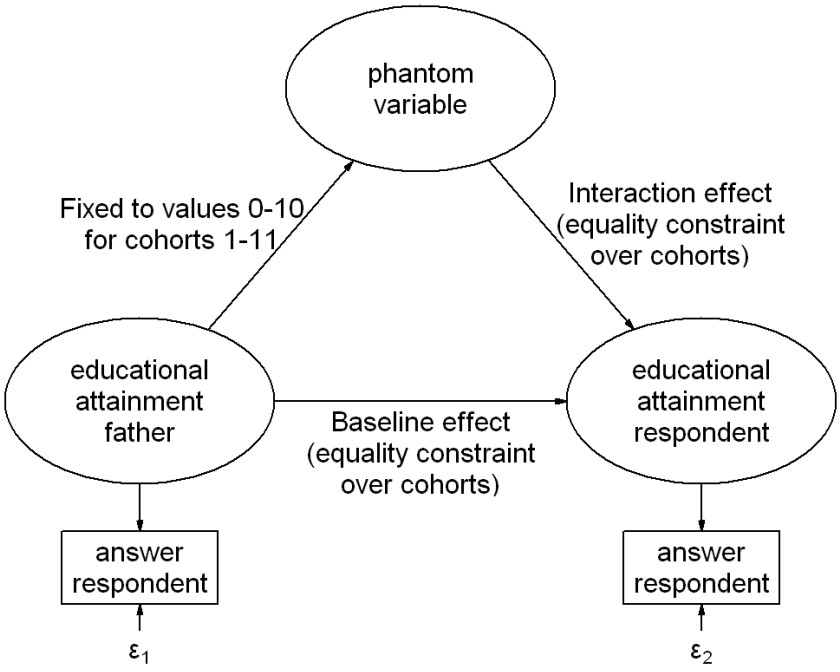
However, occupational status does change after the age of 25. For this reason, we perform our analyses on occupational status twice: first we use current educational attainment and occupational status, and second we use educational attainment and occupational status at the age of 25. A disadvantage of using information regarding the situation at age 25 is that we have more missing values for this variable since not all respondents have supplied complete information about their work history. Moreover, instead of an age effect, a period effect may now be introduced, because the moment of age 25 is in a different period for people born in a different cohort, while the current occupation is in the same period, regardless of the cohort they were born in. However, since a period effect is usually not linear like an age effect, the bias caused by a period effect is less severe. Furthermore, we do not have information about the reliability of the information concerning the situation at age 25. This reliability could be lower than information about the present situation, because people have to think back in time and because these variables are constructed by using several variables (the start year/month and the end year/month of the occupation/education). Nevertheless, for the analyses at age 25, we use the reliability that we found for highest completed education and current/last occupational status.

In Model 1 all variables are assumed to be measured without error. This assumption is usually made in the analysis of cohort effects. Model 1 is estimated twice. In Model 1a the effects are estimated for each cohort separately. Model 1b restricts the interaction effect between birth cohort and the other explanatory variables to be linear. Thus, the sizes of the effects of the explanatory variables are either linearly decreasing or linearly increasing over cohorts.

In LISREL, the use of linear interaction effects is less straightforward than in other statistical packages, since it is not possible to create an interaction variable in LISREL. For that reason we create phantom variables (Rindskopf, 1984), which are variables without

indicators. As an example, we will describe how we specified the linear cohort effect for father's educational attainment on son's/daughter's educational attainment, which is graphically represented in Figure 3.1. First, we specified an effect of father's educational attainment on son's/daughter's educational attainment, which is restricted to be the same in all cohorts. Then we created a phantom variable. Father's educational attainment has a fixed effect on the phantom variable, which is equal to the cohort number (i.e., the cohort number minus one, so it is 0-10). The phantom variable has an effect on son's/daughter's educational attainment, which is again restricted to be the same in all cohorts; this effect is the cohort effect. For each cohort, the effect of father's educational attainment can be split up into a 'direct effect' and an 'indirect effect' via the phantom variable. For cohort 1, the oldest cohort, the 'total effect' equals the 'direct effect', since there is no 'indirect effect', because the effect of father's educational attainment on the phantom variable has been restricted to 0. For cohort 2, the 'total effect' is the 'direct effect' plus one, times the effect of the phantom variable on son's/daughter's educational attainment, etc. In summary then, we get two effects, namely the effect for the first cohort and the interaction effect, just as when one specifies interaction in the usual way.

Figure 3.1 Linear restriction on cohort effect with phantom variable



Model 2 incorporates measurement error in the analyses. In the previous chapter we found that measurement error in father's educational attainment and father's occupational status is

random too, and explains 22.7 and 26.0 percent of the total variance of these variables, respectively. Furthermore, we assumed the error variance in educational attainment and occupational status to be 15 percent and 20 percent of the total variance of these variables, respectively, and that this error is random. The sizes of the error variances are based on the correlations between the answers of primary respondents about themselves and the answers of the parents about the primary respondents. Model 2 is also estimated twice. Both Model 2a and Model 2b are presented in Figures 2-7; Model 2a, with nonlinear cohort effects, is presented in Table 3.2, while Model 2b, in which cohort effects are restricted to be linear, is presented in Table 3.3.

The model fit is evaluated using three fit statistics. The first is the Chi-square. If the Chi-square is significant, this implies that the estimated model deviates significantly from the saturated model. However, if the number of cases is large, the Chi-square is likely to be significant. The second fit statistic is the BIC (Bayesian Information Criterion, Raftery, 1993, 1995), which takes the number of cases into account. A negative value means that the model estimated fits better than the saturated model. The third is the RMSEA (Root Mean Square Error of Approximation), which is the average error per degree of freedom. This fit statistic also takes the number of cases into account. In general, a value below .05 is considered to imply a good fit (Browne and Cudeck, 1993).

3.4 Model 1: No measurement error

Table 3.2 presents the standardized effects of father's educational attainment and occupational status on son's/daughter's educational attainment and the effects of father's occupational status and son's/daughter's educational attainment on son's/daughter's occupational status, for each cohort separately. These effects are allowed to differ between cohorts without the restriction of a linear cohort effect. Model 1a is the model in which variables are assumed to be measured without error. Since it is difficult to get an easy grasp of the change in the effects from this table, the effects are also presented in Figures 3.2-3.7. We will discuss the unconstrained effects only if they deviate strongly from the linear trend.

Model 1b of Table 3.3 shows the effects of family background on educational attainment and occupational status. In this model, an increase or a decrease of the effects of father's educational attainment, father's occupational status, son's/daughter's educational attainment, and female over time is allowed, but the trends are restricted to be linear. The Chi-square of the model is significant, but this could be due to the large sample size (n = 6,414). The BIC value of Model 1b is clearly negative. The RMSEA of Model 1b is .044.

In Table 3.3 the effects (of family background, educational attainment, female, and age) for the oldest cohort are presented, as well as the interaction effects and the effects for the youngest cohort. The effects for the youngest cohort are actually redundant, but are given

Table 3.2 Standardized effects for each birth-cohort

		Father's educcational attainment on son's/daughter's educcational attainment		Father's status on son's/daughter's educcational attainment		Father's status on status		Educational attainment on son's/daughter's status			Father's status on son's/daughter's status at age 25		Educational attainment at age 25 on status at age 25	
Cohort	n	1a	2a	1a	2a	1a	2a	1a	2a	n	1a	2a	1a	2a
1925-1929	108	.430	.542	.173	.131	.290	.287	.447	.534	101	.269	.279	.490	.574
1930-1934	348	.355	.406	.179	.190	.212	.209	.500	.602	318	.262	.309	.391	.448
1935-1939	467	.470	.621	.165	.091	.201	.215	.480	.577	429	.237	.273	.489	.581
1940-1944	570	.304	.360	.204	.213	.164	.181	.479	.573	535	.173	.209	.476	.563
1945-1949	784	.392	.536	.166	.084	.137	.128	.492	.601	716	.122	.125	.419	.506
1950-1954	812	.388	.575	.074	-.064	.154	.141	.496	.600	737	.145	.165	.440	.525
1955-1959	930	.283	.380	.161	.110	.108	.089	.498	.611	804	.129	.126	.469	.567
1960-1964	973	.264	.355	.116	.063	.147	.147	.486	.586	851	.206	.241	.359	.419
1965-1969	804	.271	.366	.114	.060	.144	.147	.491	.591	706	.135	.170	.431	.514
1970-1974	448	.226	.268	.165	.166	.070	.038	.662	.817	390	.041	.024	.477	.585
1975-1979	142	.020	-.243	.207	.475	.264	.313	.457	.533	131	.205	.239	.475	.568

Note: 1a = model without measurement error.
2a = model with imputed measurement error.

Figure 3.2 Effect of father's educational status on son's/daughter's occupational status

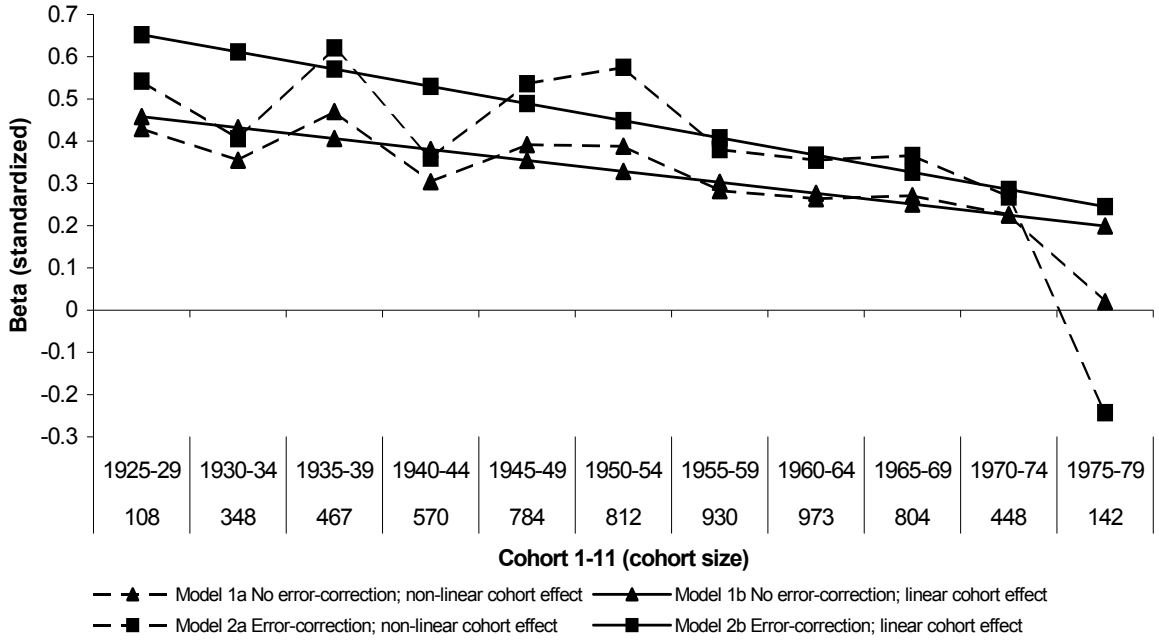


Figure 3.3 Effect of father's occupational status on son's/daughter's educational attainment

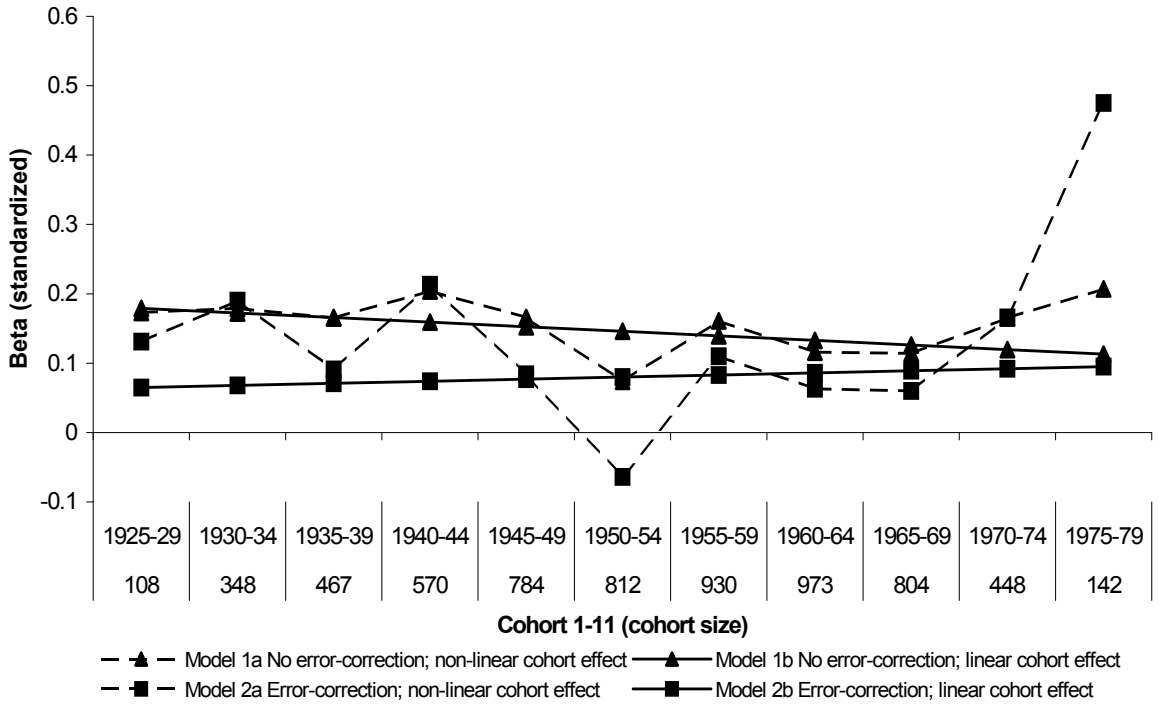


Figure 3.4 Effect of father's occupational status on son's/daughter's current/last occupational status

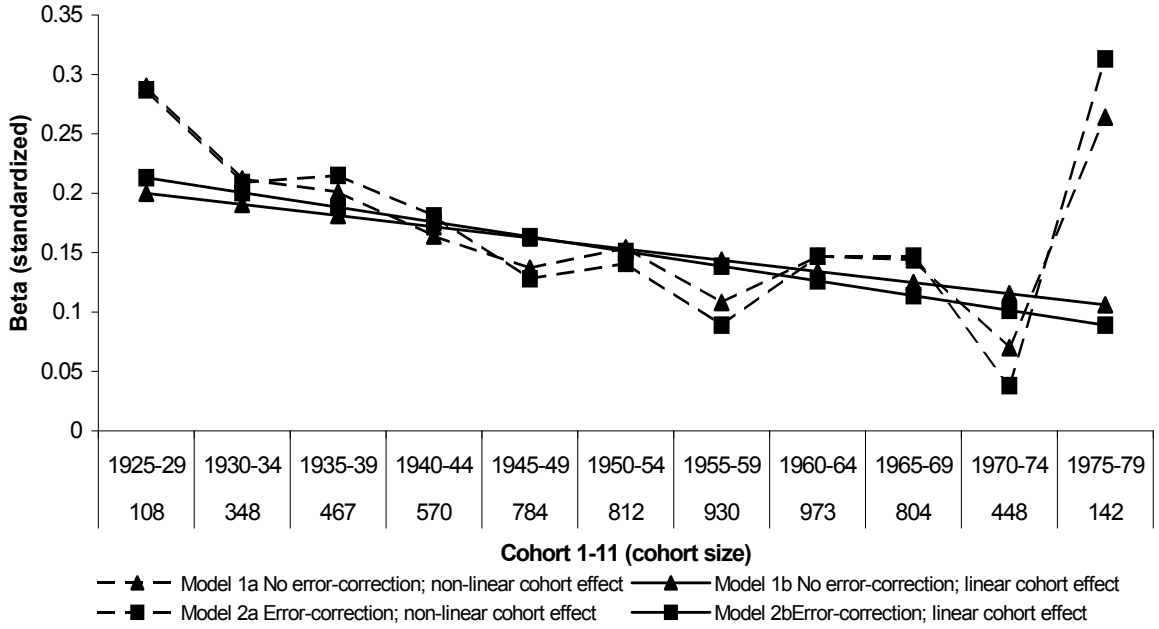


Figure 3.5 Effect of son's/daughter's educational attainment on current/last occupational status

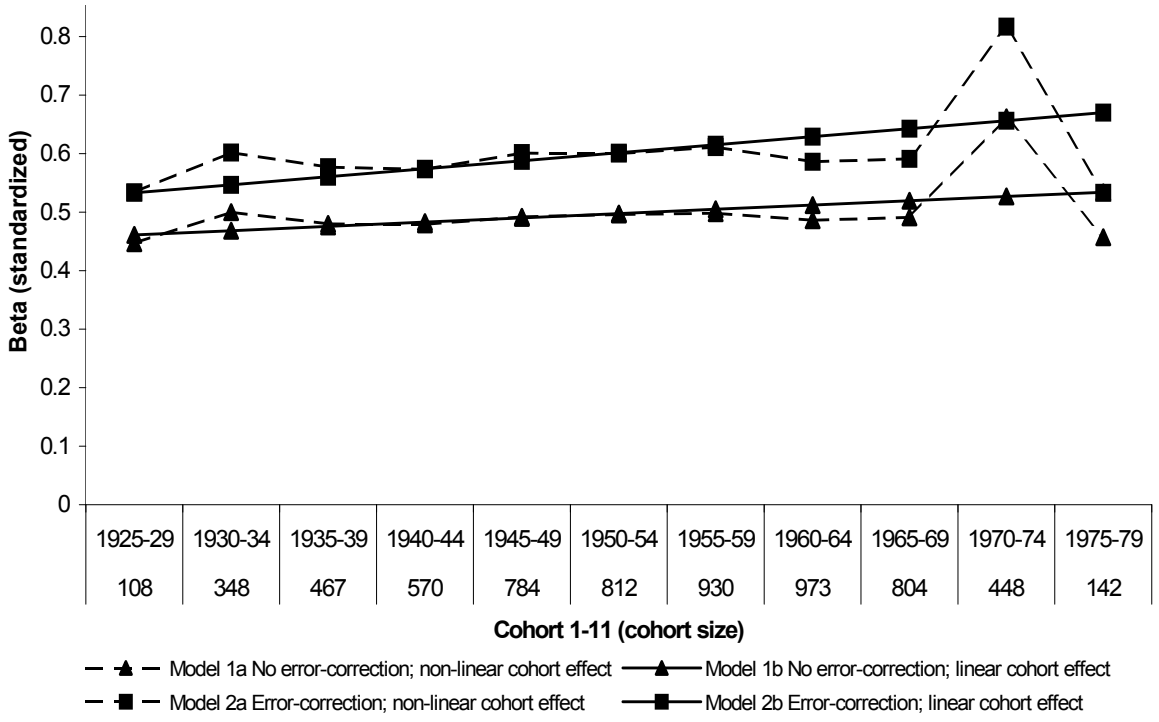


Figure 3.6 **Effect of father's occupational status on son's/daughter's occupational status at age 25**

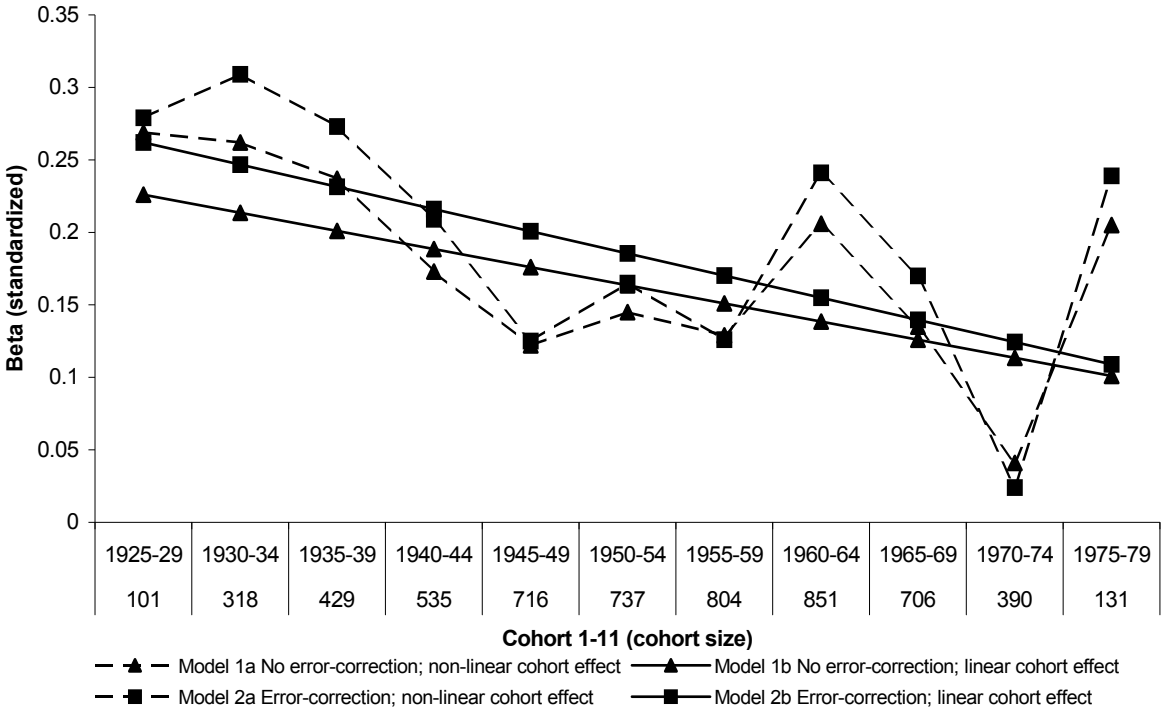


Figure 3.7 **Effect of son's/daughter's educational attainment at age 25 on occupational status at age 25**

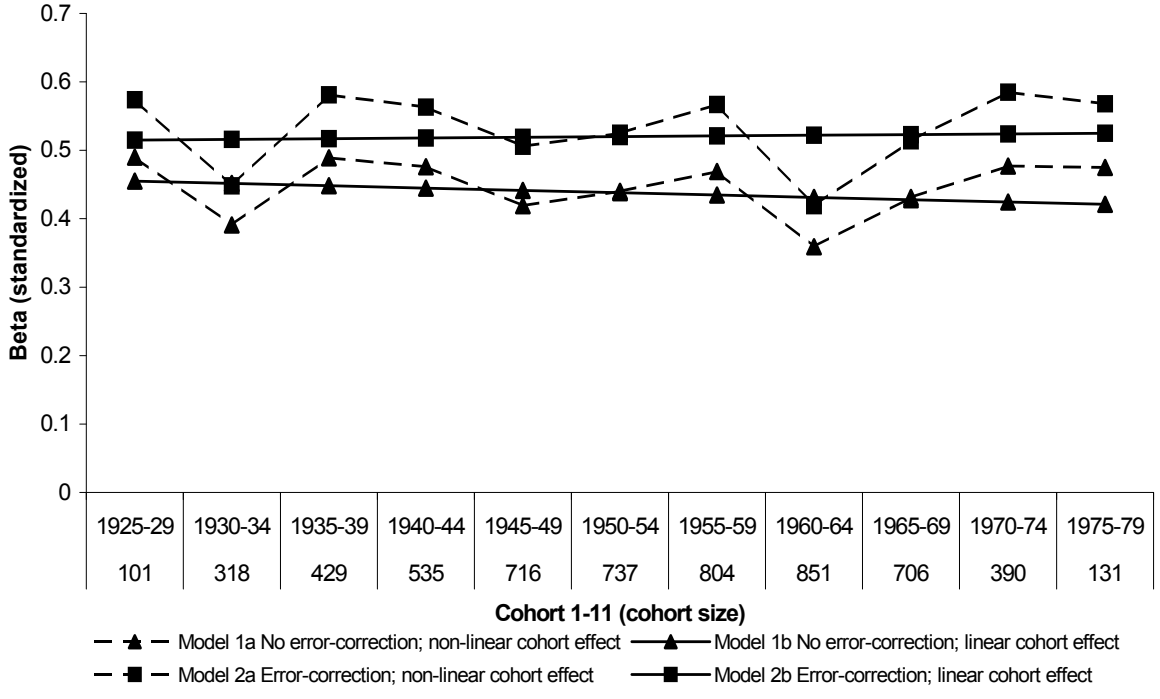


Table 3.3 Effects of family background on educational attainment and status attainment over cohorts

	Model 1b no measurement error			Model 2b imputed measurement error		
	b	s.e.	beta	b	s.e.	beta
Effects on respondent's educational attainment						
Effects for cohort 1 (1925-1929)						
Father's educational attainment (6-20)	**.470**	.035	.458	**.703**	.075	.652
Father's occupational status (10-90)	**.037**	.007	.179	.014	.016	.065
Female (male=0, female=1)	**-1.814**	.179	-.278	**-1.820**	.181	-.303
Age (25-84)	-.017	.009	-.020	-.017	.009	-.022
Interaction effects						
Father's educational attainment × cohort	**-.027**	.006		**-.045**	.013	
Father's occupational status × cohort	-.001	.001		.001	.003	
Female × cohort	**.219**	.030		**.219**	.030	
Effects for cohort 11 (1975-1979)						
Father's educational attainment (6-20)	**.204**	.031	.199	**.249**	.065	.245
Father's occupational status (10-90)	**.023**	.006	.113	**.024**	.014	.095
Female (male=0, female=1)	**.371**	.158	.057	**.374**	.157	.062
Age (25-84)	-.017	.009	-.020	-.017	.009	-.022
R square	.197			.275		
Effects on respondent's occupational status						
Effects for cohort 1 (1925-1929)						
Father's occupational status (10-90)	**.201**	.027	.200	**.223**	.039	.213
Respondent's educational attainment (6-20)	**2.279**	.130	.461	**2.557**	.165	.533
Female (male=0, female=1)	**-4.191**	.820	-.130	**-3.478**	.833	-.121
Age (25-84)	**.101**	.042	.024	**.111**	.043	.030
Interaction effects						
Father's occupational status × cohort	**-.009**	.005		**-.013**	.007	
Educational attainment × cohort	.036	.022		**.065**	.028	
Female × cohort	**.401**	.138		**.321**	.140	
Effects for cohort 11 (1975-1979)						
Father's occupational status (10-90)	**.107**	.023	.106	**.093**	.033	.089
Respondent's educational attainment (6-20)	**2.638**	.117	.534	**3.212**	.149	.670
Female (male=0, female=1)	-.183	.711	-.006	-.266	.718	-.009
Age (25-84)	**.101**	.042	.024	**.111**	.043	.030
R square	.335			.477		
Chi-square	675			681		
df	209			209		
RMSEA	.044			.045		
BIC	-1157			-1191		
N	6414			6414		

Table 3.3 continued

	Model 1b no measurement error			Model 2b imputed measurement error		
	b	s.e.	beta	b	s.e.	beta
Effects on respondent's occupational status at age 25						
Effects for cohort 1 (1925-1929)						
Father's occupational status (10-90)	**.212**	.027	.226	**.256**	.039	.262
Respondent's educational attainment at age 25 (6-20)	**2.491**	.156	.455	**2.736**	.194	.515
Female (male=0, female=1)	-.097	.806	-.003	.139	.811	.005
Age (25-84)	-.014	.043	-.004	-.007	.043	-.002
Interaction effects						
Father's occupational status × cohort	**-.012**	.005		**-.015**	.006	
Educational attainment at age 25 × cohort	-.019	.027		.005	.033	
Female × cohort	.213	.137		.169	.138	
Effects for cohort 11 (1975-1979)						
Father's occupational status (10-90)	**.095**	.024	.101	**.107**	.033	.109
Respondent's educational attainment at age 25 (6-20)	**2.304**	.142	.421	**2.790**	.176	.525
Female (male=0, female=1)	**2.031**	.719	.070	**1.827**	.721	.070
Age (25-84)	-.014	.043	-.004	-.007	.043	-.002
R square	.261			.378		
Chi-square	658			641		
df	209			209		
RMSEA	.048			.046		
BIC	-1150			-1151		
N	5719			5719		

Note: Bold figures indicate that the effect is significant at the .05 level for a one-sided test.

for convenience. Most effects in Model 1b are in line with previous findings for the Netherlands:

(a) the effect of father's educational attainment on son's/daughter's educational attainment:
Father's educational attainment has a strong positive effect on son's/daughter's educational attainment. This effect decreases over time and this decrease is significant.

(b) the effect of father's occupational status on son's/daughter's educational attainment:
Father's occupational also has a positive effect on son's/daughter's educational attainment, but this effect is much smaller than the effect of father's educational attainment. The trend effect is negative, but, in contrast to previous research that used a larger sample, the trend effect is not significant.

(c) the direct effect of father's occupational status on son's/daughter's occupational status:

The effect of father's occupational status on son's/daughter's occupational status is positive and significant. This effect declines significantly over time. This applies to both occupational status at age 25 and present/last occupational status.
(d) the effect of educational attainment on son's/daughter's occupational status:
Educational attainment has a positive effect on occupational status. This effect is much stronger than the effect of father's occupational status. This holds for both occupational status at age 25 and present/last occupational status. No significant trend over time is present.

The trends are presented graphically in Figures 2-7. The figures present the standardized effects. In this way, the effects for Model 1b are better comparable with the effects of Model 2b. In the latter model, the variance of the variables that are assumed to contain measurement error is smaller than in the first model. Since the standardized effects take this into account, they are better comparable. The effects are standardized with the same metric for all cohorts. If the effects for each cohort were standardized using the variance of each cohort, then the decline in the effects of social background would not be linear even if the decline in the unstandardized effect is restricted to be linear. Dashed lines represent the effect for each cohort separately. Solid lines represent the effects under the assumption of a linear change of these effects over cohorts. Triangles indicate effects in models without measurement error correction and squares indicate effects in models with measurement error correction.

There are only a few deviations from the linear trends. From Model 1a it can be deduced that especially the youngest cohort is an outlier in the sense that the effect is much smaller/larger than would be expected on the basis of the linear trend. This could be due to sample fluctuation (due to the small sample size of this cohort) or due to the fact that this cohort is still young. However, the deviation cannot be completely attributed to the fact that the last cohort is relatively young, since the effect for the youngest cohort is also small for the analysis with occupational status at age 25 (Figure 3.6) where no age effect is present. Furthermore, in the youngest cohort, the effect of father's educational attainment on son's/daughter's educational attainment is smaller than might be expected on the basis of the linear trend, while the effect of father's status is greater. A possible explanation is that, although most people have completed their educational career by the age of 25, those who have completed their education might not be representative for the whole cohort. Especially those following (post-)university education (generally those with higher educated parents) might not have completed their education yet. Since the size of the youngest cohort is small, the effect of this cohort on the magnitude of the decline is small too.

In contrast to our expectations, father's occupational status and son's/daughter's educational attainment do not have a stronger effect on the occupational status at the age of 25 than on the current/last occupational status.

It has consistently been found that women have a disadvantaged social position, but that this disadvantage has become smaller during the past century. Model 1b in Table 3.3

shows that women indeed have a lower educational attainment and a lower occupational status than men in the first cohort. This disadvantage has declined. For the youngest cohort, women even have a higher educational attainment than men, while no significant difference exists for the status of the current/last occupation. With respect to occupational status at age 25, in the first cohort no difference between men and women exists; over cohorts, a disadvantage for men arises, which is somewhat surprising. This can be explained by the fact that occupations that are typically occupations filled by women in the Netherlands, are occupations with a high status internationally according to the ISEI (Pollearts, De Graaf, and Luijkx, 1997).

In summary then, we seem to have replicated the majority of conclusions of previous research rather well with our data.

3.5 Model 2: Imputed measurement error

In Model 2a (presented in Table 3.2) we again estimate the separate effects for the cohorts (as in Model 1a), but now measurement error is incorporated into the analyses. The size of the error has been obtained from the previous chapter. Again, we do not pay much attention to this table, since it is not easy to distinguish the trend in this table. In Model 2b the change in the effects over cohorts is restricted to be linear. The model fit hardly differs from Model 1b. However, we do find remarkable differences in the structural effects:

(a) the effect of father's educational attainment on son's/daughter's educational attainment:

In Chapter 2 we found that the effect of father's educational attainment on son's/daughter's educational attainment is stronger after correction for measurement error. Again, the effect of father's educational attainment on son's/daughter's educational attainment is stronger in Model 2b than in Model 1b. Further, the negative trend in this effect is stronger after correcting for measurement error. The difference between the corrected and the uncorrected model is strongest for the oldest cohort, while for the youngest cohort, hardly any difference exists. The change in the effect for the first cohort is significant ($p < .05$), but the change in the effect for the last cohort and the change in the trend are not significant[17]. These effects are represented graphically by the squares in Figure 3.2. The dashed line represents the effects without a linear restriction on the cohort effect, while the solid line represents the model with a linear trend. It turns out that the effect for the youngest cohort deviates strongly from the effects for the other cohorts. One might assume that the fact that the decline is stronger in Model 2b than in Model 1b is due to the deviating effect for the youngest cohort. However,

[17] We computed the significance using the formula: $T = (b_1 - b_2)/\sqrt{(se_2^2 - se_1^2(var_{\varepsilon 2}/var_{\varepsilon 1})}$), where b_1 and b_2 are the unstandardized regression coefficients, se_1 and se_2 are the standard error of the regression coefficients, and $var_{\varepsilon 1}$ and $var_{\varepsilon 2}$ are the unexplained variances in the dependent variables (Clogg, Petkova, and Haritou, 1995).

additional analysis (not shown here) shows that the decline in Model 2b is also much larger than in Model 1b if we exclude the youngest cohort.

(b) the effect of father's occupational status on son's/daughter's educational attainment:

The previous chapter showed that the effect of father's occupational status on educational attainment is weaker if this effect is corrected for measurement error. This finding is replicated in this chapter, but the difference between Model 1b and Model 2b is not significant. The non-significant *negative* trend in the effect of father's occupational status on son's/daughter's educational attainment changes into a non-significant *positive* trend. Because the trend effects are not significant, we do not pay attention to the change of the sign of the trend effect. The effects are displayed graphically in Figure 3.3. Again, the youngest cohort deviates strongly from the linear trend after correcting for measurement error. However, leaving this cohort out of the analysis does not affect the linear change of the effect over cohorts. Finally, the R square is substantially stronger after correcting for measurement error (from .197 to .275).

(c) the direct effect of family background on occupational status:

The previous chapter showed that the effect of father's occupational status on son's/daughter's (current/last) occupational status was not affected by measurement error. Again, the present chapter replicates this finding. Nevertheless, the effect on occupational status at age 25 is larger (although not significantly) after error correction. For both current/last occupational status and status at age 25, the decline in the effect of father's occupational status over cohorts becomes somewhat (but not significantly) stronger after incorporating the presence of measurement error.

(d) the effect of educational attainment on occupational status/class:

We established in Chapter 2 that the effect of educational attainment on occupational status is stronger after incorporating measurement error into the model. This finding is replicated in this chapter for both the effect of highest completed educational attainment on current/last occupational status and the effect of educational attainment at age 25 on occupational status at age 25; the differences between Model 1b and Model 2b in the effects of highest completed educational attainment and educational attainment at age 25 are significant. The positive trend in the effect of highest completed educational attainment is stronger than in Model 1b and significant[18], while the negative trend in the effect of educational attainment at age 25 is positive now, but still non-significant. Both changes in the trend have the same result: the difference between the corrected and the uncorrected model is greater for the youngest cohort than for the oldest one. Again, the R square is much stronger after incorporating measurement error into the model (.477 versus .335 for current/last status and .378 versus .261 for status at age 25).

[18] This is mainly due to the incorporation of measurement error for respondent's educational attainment and occupational status. Incorporating measurement error only in father's educational attainment and father's occupational status, makes the interaction effect somewhat greater (i.e., it increases from .036 to .044).

The effect of being a woman on educational attainment hardly differs between Model 1b and Model 2b. This applies to the effect for the oldest cohort, to the change in the effect over cohorts, and to the effect for the youngest cohort. The same is true for the effect of being female on occupational status, although it seems that the disadvantage for women in the oldest cohort is smaller in Model 2b than in Model 1b (b = -3.478 versus -4.191). However, this difference is mainly due to the fact that the variance of occupational status is smaller after taking measurement error into account. The standardized effects hardly differ. Looking at status at age 25, the average effect of being female for all cohorts is the same after error correction, but the improvement of the position of women over cohorts, is somewhat smaller.

3.6 Conclusion and discussion

In this chapter we investigated trends in the effects of social background on educational attainment and occupational status. In general we could replicate previous findings for the Netherlands pretty well with our data: Dutch society has become more open. The effects of social background have decreased in the Netherlands.

Next, we corrected for measurement error, using the information found in the previous chapter. In the previous chapter we found that the effect of father's educational attainment on son's/daughter's educational attainment is stronger, while the effect of father's occupational status is insignificant, after taking measurement error into account. This chapter has shown that this change is especially present for the oldest birth cohorts.

After correcting for measurement error, the trend towards more openness (i.e., decreasing influence of father's educational attainment and increasing influence of own educational attainment) in the Netherlands is somewhat stronger, but not significantly so. The difference in these trends between the corrected and the uncorrected model is very small. Moreover, the influence of father's occupational status on educational attainment seems to become more important over time after error correction, although this trend is not significant.

Unfortunately, we could not test whether measurement error is stable over cohorts. We did not have enough information provided by multiple informants for the oldest age categories, and age is strongly related with cohort due to the fact that the survey years are close together (1992-2003).

In summary then, our analyses gave no support for the assumption that the growing openness found in Dutch society is due to measurement error.

Chapter 4: A parental resources model for educational attainment

Summary

This chapter examines whether measurement error in father's educational attainment and occupational status, and parental cultural and material resources leads to biases in the effects of these variables on educational attainment. The role of cultural resources in the educational attainment process turns out to be more important than conventional research suggests: educational reproduction via cultural resources doubles if measurement error is taken into account. This is due to the fact that both the effect of father's educational attainment on parental cultural consumption and the effect of parental cultural consumption on son's/daughter's educational attainment are stronger after measurement error is taken into account. The direct effect of father's occupational status on respondent's educational attainment disappears. Other effects do not change strongly. Respondent's information on material resources is biased towards other variables (sex and father's educational attainment).

4.1 Introduction

In Chapter 2 we estimated the effects of social background on educational attainment and status attainment, controlling for measurement error. We replicated the finding that father's educational attainment affected respondent's educational attainment positively, and found that this effect is more important (especially compared to the effect of father's occupational status) than conventional research suggests. In this chapter we set out to find an explanation for the effect of father's educational attainment. The Blau-Duncan model (Blau and Duncan, 1967) has been elaborated in several ways with variables that could explain the relation between social background and educational attainment. We focus on one of the most successful explanations, namely parental cultural and material resources. Material resources refer to money and material possessions. Cultural resources refer to active and passive cultural consumption. Bourdieu (1970) and Collins (1971) played an important role in this extension of research on status attainment.

According to Bourdieu (1970), cultural participation is much higher in higher educated families, resulting in the children of higher educated parents being more familiar with highbrow culture than the children of lower educated families. Among teachers, cultural participation is very high as well. This leads to the children of higher educated parents being more familiar with the dominant culture at school, while most children from the lower classes have negative predispositions towards school. Bourdieu uses the term cultural capital to highlight the importance of cultural participation as a resource. In this way, Bourdieu argues

that academic success is directly dependent on cultural capital. The educational system reproduces the existing social structure.

Collins (1971) states that schools do not only teach vocational skills, but also status cultures; schools teach, for example, vocabulary and aesthetic tastes. If culture plays an important role at school, higher educated parents, who have spent more time at school, are more likely to have developed a cultural taste and hence are more likely to participate more in cultural activities than lower educated parents. Moreover, children whose parents participate in cultural activities are already familiar with the school climate and benefit from this at school.

Reproduction via material resources seems more obvious a phenomenon. The higher social milieus have more material resources. These resources can be used to get paid coaching in school subjects or to allow the children to follow a language course in a foreign country. Moreover, the more wealth in the parental home, the less the need for the children to quit schooling in order to earn money.

In summary then, if social reproduction takes place via cultural and material resources, this assumes the presence of five relations:

(a) an effect of family background (father's education and occupation) on cultural resources;

(b) an effect of cultural resources on son's/daughter's educational attainment;

(c) an effect of family background (father's education and occupation) on material resources;

(d) an effect of material resources on son's/daughter's educational attainment;

(e) a smaller or no effect of family background on son's/daughter's educational attainment after controlling for cultural and material resources.

We discuss previous research with respect to these five effects. Some previous research investigated parental cultural consumption, while others looked at son's/daughter's cultural consumption or both parental and son's/daughter's cultural consumption. We restrict our discussion to *parental* cultural resources.

(a) the effect of family background on cultural resources:

De Graaf (1986), De Graaf (1989), Mohr and DiMaggio (1995), Kalmijn and Kraaykamp (1996), De Graaf, De Graaf, and Kraaykamp (2000), Kraaykamp (2000) and Sullivan (2001) showed that social background has a positive effect on parental cultural resources in the Netherlands, the United States, and Great Britain.

(b) the effect of cultural resources on son's/daughter's educational attainment:

Various previous empirical research has shown that parental cultural resources have a positive effect on children’s educational career and attainment in Germany (De Graaf, 1988; Aschaffenburg and Maas, 1997), Australia (Crook, 1997), Great Britain (Sullivan, 2001), the United States (Kalmijn and Kraaykamp, 1996) and the Netherlands (De Graaf, 1986; De

Graaf 1989; Niehof, 1997; De Graaf, De Graaf, and Kraaykamp, 2000; De Graaf and De Graaf, 2002, 2003).

(c) the effect of family background on material resources:

According to De Graaf (1989) and De Graaf, De Graaf, and Kraaykamp (2000), social background has a positive effect on parental material resources in the Netherlands.

(d) the effect of material resources on son's/daughter's educational attainment:

For Germany, De Graaf (1988) did not find an effect of material resources on educational attainment. However, for the Netherlands (De Graaf, 1989; Niehof, 1997; De Graaf, De Graaf, and Kraaykamp, 2000; De Graaf and De Graaf, 2002, 2003) and Australia (Crook, 1997) an effect of material resources on educational attainment has been found. According to Niehof (1997) the effect of material resources is just as strong as the effect of cultural resources, but De Graaf (1989), De Graaf and De Graaf (2002, 2003) show that the effect of cultural resources is stronger than the effect of material resources.

(e) the direct effect of social background on son's/daughter's educational attainment after controlling for cultural and/or material resources:

Holding constant cultural and/or material resources, social background still has a positive effect on son's/daughter's educational attainment (De Graaf, 1986; De Graaf, 1988; Kalmijn and Kraaykamp, 1996; Aschaffenburg and Maas, 1997; Crook, 1997; Niehof, 1997; Sullivan, 2001; De Graaf and De Graaf, 2002, 2003). De Graaf (1989) reports no effect of social background after controlling for financial and cultural resources.

In the majority of the studies discussed above, retrospective information about the parents is obtained by interviewing sons and daughters. Answering these questions correctly may be problematic, because the questions refer to a situation in the past (when the respondents were between 12 and 15 years of age) and refer to someone other than the respondent. Kraaykamp (2000), who used panel data, found a smaller effect of cultural resources than previous research and suggests that this might be due to an overestimation of this effect in previous research because of the use of retrospective other-report data. According to De Graaf, De Graaf, and Kraaykamp (2000), the reliability of parental 'beaux arts' participation and reading is low, namely .60, but not correlated with son's/daughter's cultural participation. We have shown in Section 1.4 that the consequences of family background effects caused by measurement error depend upon whether the error is random or correlated. Random error results in an underestimation of bivariate effects between variables. Still, in a multivariate analysis, random error can cause either an under- or an overestimation. Errors in the answers of respondents about their parents can be correlated with either other characteristics of the parents or with characteristics of the respondents. In the first case, the relation between two explanatory variables (for example father's occupational status and parental material resources) will be overestimated, which can also influence the effects of these variables on son's/daughter's educational attainment. In the second case, the influence of

father's educational attainment on son's/daughter's educational attainment will be overestimated.

In this chapter we investigate to what degree the role of parental resources in the educational attainment process is biased by the retrospective and other-report design in conventional research. We estimate linear structural models in which we include the information given by the primary respondents, one of their parents, and one of their siblings, and examine whether the model estimates differ.

4.2 Data and descriptives

4.2.1 Data

Data from the repeated cross-sectional retrospective life-course survey Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000) are analyzed. In these three surveys, primary respondents and their (married or unmarried) partners were interviewed in face-to-face interviews and requested to fill out self-completion questionnaires. Samples were drawn from the population registers from a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents respectively (giving a total of 4,590 respondents).

Because many of the older respondents do not have living parents, and because we want to avoid the parental source addressing respondents in a different age range than the respondent and sibling sources, only respondents of 54 years or younger are included in the analysis. About 86 percent of these respondents, had at least one parent still living at the time of the interview. Further, about 90 percent of the respondents (in the 1992 and 2000 surveys[19]) reported having at least one living sibling. A second age selection has been made by excluding respondents under age 25, because many of the younger respondents had not completed their educational career at the time of the interview. These age selections leave us with a total of 3,086 respondents for whom we have valid respondent information on father's educational attainment and occupational status, parental cultural and material resources, and on respondent's educational attainment, birth year and sex.

In the surveys, respondents were asked to give their parents' address and the address of one randomly selected sibling. Then the siblings and parents were sent a questionnaire by mail, with a stamped return envelope. After two reminders, the second one again accompanied by the questionnaire and return envelope, completed parent questionnaires were

received from 43 percent of the respondents with living parents. The response rate of siblings under respondents with at least one living sibling was 39 percent. The non-response has two causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all questionnaires contain all information we want to include in our analysis: in 1998 parents were asked only about their education and not about their occupation and cultural/material resources when the primary respondent was 15 years old, and in all three questionnaires no questions were asked about deceased spouses of the surviving parent. This means that, although we have data from 3,086 respondents between 25 and 54 years old who answered the question about their father's education and occupation and parental cultural and material resources, we have parent reports on father's education for 897 respondents, parent reports on father's occupation for 409 respondents, on material resources for 539 respondents and on cultural resources for 498 respondents. For 347 respondents, we have parent reports on all four family background variables. In addition, we have sibling reports on father's education and father's occupational status for 611 and 576 respondents, respectively; sibling reports on material resources and cultural resources for 627 and 621 respondents, respectively, and sibling reports on all four family background variables for 540 respondents.

Highest completed education[20] of fathers and sons/daughters is the number of years necessary to complete the level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[21]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years . Father's occupational status when the respondent was 15 years old is coded according to the International Socio Economic Index (ISEI) scale, constructed by Ganzeboom, De Graaf, and Treiman (1992).

Parental material resources at the age of 15 have been measured using a list of items (see Table 4.1). Although the items differ between the survey years, the variable material resources is comparable across survey years and informants, due to the way we recoded it. Most items refer to valuables and are dichotomous (that are either present or not present in the parental home). The items have been standardized by awarding percentiles to answer categories on the basis of the proportion that gave the specific answer. For example, if 80 percent had a refrigerator and 20 percent did not have one, then those who did not have a fridge got the score of 10 (the average of 0 and 20) and those who did have one got the score of 60 (the average of 20 and 100). The average percentile of each item is 50. The items have been standardized within each survey year in order to make different items for different years

[19] In the 1998 survey, siblings were not questioned about their parents.
[20] The questions on all family background variables are presented in Appendix I.

comparable. We lose information about small differences between the survey years (due to cohort differences) in material resources, but this does not matter since these differences will be small and we are not interested in cohort differences. The answers in the parent and sibling questionnaires were coded on the basis of the percentiles among primary respondents. This prevents differences occurring between respondent scores and parent/sibling scores due to the fact that the answers of parents and siblings were standardized in a different way. The items incorporated into the scale used for analysis were selected on the basis of both theoretical and empirical (reliability analysis) arguments. Table 4.1 presents the factor loadings of the items selected. The final score for material resources is the mean of the various items. Only cases with a valid value on at least half of the items used received a valid score. Cronbach's alpha varies between .663 and .850.

Table 4.1 Factor loadings of the different material resources items, reliability of the total scale

Survey year:		1992		1998		2000	
Source:	Respondent	Parent	Sibling	Respondent	Respondent	Parent	Sibling
Rented house or own house				.493			
Number of rooms per person in house	.589	.542	.462	.477			
Own bedroom or shared bedroom	.590	.490	.489				
Heated bedrooms	.760	.760	.812	.700			
Garage	.500	.513	.547		.570	.627	.622
Telephone	.707	.642	.668				
Car	.693	.677	.678	.673	.667	.537	.733
Refrigerator	.611	.573	.578				
Photo-camera	.581	.613	.517				
Video-camera				.527	.526	.639	.485
Television	.593	.575	.596				
Automatic dishwasher				.502	.483	.660	.517
Dia -projector	.512	.540	.531				
Open fire	.445	.489	.547				
Central heating	.751	.786	.798		.667	.590	.652
Freezer				.550	.626	.577	.491
Video-recorder				.494	.560	.613	.507
Cronbach's alpha	.850	.840	.835	.671	.684	.695	.663

[21] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.

The cultural items have also been standardized. Parental cultural resources at age 15 refer to both reading and (passive) cultural participation. The items differ somewhat between survey years (see Table 4.2). In addition, the items in the respondent and sibling questionnaire refer to both parents, while the items in the parental questionnaire only refer to the parent who filled out the questionnaire. The items have been standardized in the same way as the material resources items. We used both theoretical and empirical (reliability analysis) arguments to select the items. The factor loadings of the items are shown in Table 4.2. The score for cultural resources is the mean of the items, using only cases having a valid score on at least half of the items. Cronbach's alpha is between .797 and .855.

Table 4.2 Factor loadings of the different culture items. reliability of the total scale

Survey year:		1992			1998		2000	
Source:		Respondent	Parent	Sibling	Respondent	Respondent	Parent	Sibling
Visit architecture		-	-	-	.696	.721	.734	.753
Visit museum of arts		.773	.737	.763	.744	.724	.789	.776
Visit historical museum		.699	.649	.700	.633	.687	.562	.645
Visit opera or ballet		.588	.555	.499	-	-	-	-
Visit classical concert		.706	.661	.665	-	-	-	-
Visit classic music/opera/ballet		-	-	-	.716	.726	.687	.694
Visit classic theatre		-	-	-	.678	.661	.724	.649
Read literary poetry		.671	.662	.561	-	-	-	-
Read Dutch literature	(father)	.739	.796	.774	.652	.597	.643	.550
	(mother)				.581	.585		.651
Read translated foreign literature		.776	.740	.769	-	-	-	-
Read literature in foreign language	(father)	.680	.693	.637	.666	.582	.679	.527
	(mother)				.608	.516		.517
Cronbach's alpha		.855	.844	.830	.845	.823	.797	.831

In the educational attainment models to be estimated, we will include sex and birth year as control variables. Sex differences have decreased significantly, but we expect to find that women attain lower levels of educational attainment. We include birth year in the models too because younger cohorts have attained higher levels of schooling.

4.2.2 Descriptives

Table 4.3 shows basic descriptive information on the variables used in the analyses. Three informants give information on father's educational attainment, and Table 4.3 presents the similarities in the answers of three types of pairs: respondent-parent pairs (n=897), respondent-sibling pairs (n=611), and parent-sibling pairs (n=288). The 3,086 respondents in the analysis reported an average education of their fathers of 9.31 years (including six years of primary education). In the subsample where parental information on father's education is present, father's educational attainment is higher (average is 10.13 years) than in the whole group of respondents. Probably, higher educated parents have a higher response rate, which may also be due to selective mortality. Moreover, parents on average have reported .28 fewer years of education than their sons or daughters; this difference is significant ($p<.05$). The correlation between the answers given by the respondents and their parents is .807. In the respondent-sibling pairs, the averages are about equal and the correlation is .803. But in the parent-sibling pairs the average according to parents is again significantly lower (.33 years). Furthermore, the correlation in the parent-sibling pairs is higher compared to the respondent-parent and respondent-sibling pairs, namely .842. Cronbach's alpha reliability coefficient of father's educational attainment is rather high, namely .931.

The results with respect to father's occupational status are similar. If there is a participating parent, father's occupational status is reported to be somewhat higher than the average of all respondents. Now, the largest (and only significant difference) is in the respondent-sibling pair. The correlation coefficients within the three pairs of informants are .786, .799 and .859, and the overall reliability coefficient is .930.

With regard to parental material resources, it again turns out that this level is somewhat higher in the subsample for which we have a parental questionnaire. The average of the answers of the three informants do not differ significantly from each other (if the same sample is considered). However, the correlations between the answers are lower than for father's education and occupation (between .656 and .793), as is Cronbach's alpha (.881).

With regard to parental cultural resources, it turns out that this level is somewhat higher in the subsample for which we also have a parental questionnaire. The average of the answers of siblings is significantly ($p < .05$) lower than the average of the answers of respondents and parents. Again, the correlations between the answers are lower (between .679 and .718), as is Cronbach's alpha (.872).

In summary then, the reliability of material and cultural resources is lower than the reliability of father's educational attainment and socio-economic status. Furthermore, in the subgroup for which we have parental information, the averages for all four variables are higher.

Table 4.3 Descriptive information about all variables in the analysis

		n	mean	s.d.	r	α
Father's educational attainment						
(in years: range 6–20)						.931
All respondents		3086	9.31	3.38		
Respondent-parent pairs:	respondent	897	**10.13**	3.42	.807	
	parent	897	**9.85**	3.56		
Respondent-sibling pairs:	respondent	611	9.38	3.40	.803	
	sibling	611	9.34	3.36		
Parent-sibling pairs:	parent	288	**9.57**	3.66	.842	
	sibling	288	**9.90**	3.56		
Father's occupational status						
(ISEI: range 10-90)						.930
All respondents		3086	44.94	16.34		
Respondent-parent pairs:	respondent	409	47.13	17.15	.786	
	parent	409	47.59	17.93		
Respondent-sibling pairs:	respondent	576	**45.82**	17.01	.799	
	sibling	576	**46.71**	17.28		
Parent-sibling pairs:	parent	239	46.86	17.27	.859	
	sibling	239	47.57	17.24		
Parental material resources						
(range 20.53–83.35)						.881
All respondents		3086	50.18	13.18		
Respondent-parent pairs:	respondent	539	54.82	12.35	.793	
	parent	539	54.26	14.20		
Respondent-sibling pairs:	respondent	627	50.93	13.21	.687	
	sibling	627	50.49	13.08		
Parent-sibling pairs:	parent	309	54.62	13.99	.656	
	sibling	309	54.40	12.48		
Parental cultural resources						
(range 31.74–98.10)						.872
All respondents		3086	50.10	14.57		
Respondent-parent pairs:	respondent	498	54.74	16.18	.687	
	parent	498	54.41	15.87		
Respondent-sibling pairs:	respondent	621	**51.59**	15.20	.679	
	sibling	621	**48.64**	13.45		
Parent-sibling pairs:	parent	292	**54.63**	15.69	.718	
	sibling	292	**50.82**	14.61		
Respondent's educational attainment						
(in years: range 6-20)		3086	11.61	3.26		
Female						
(male=0, female=1)		3086	.50			
Birth year						
(range 1938-1975; 1938=0, 1975=37)		3086	19.52	8.40		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (two-sided test); α = Cronbach's alpha reliability coefficient based on the three correlations.

4.3 Models

4.3.1 Approach to measurement error

We use the LISREL software (Version 8.54) to estimate four linear structural models, and accordingly we present the model parameters following the LISREL notation (Jöreskog and Sörbom, 1996). In Model 1 (see Figure 4.1) we only use information from primary respondents. This information is assumed to be measured without error in conventional research, and therefore we do not incorporate measurement error into this baseline model.

Figure 4.1 Model without measurement error

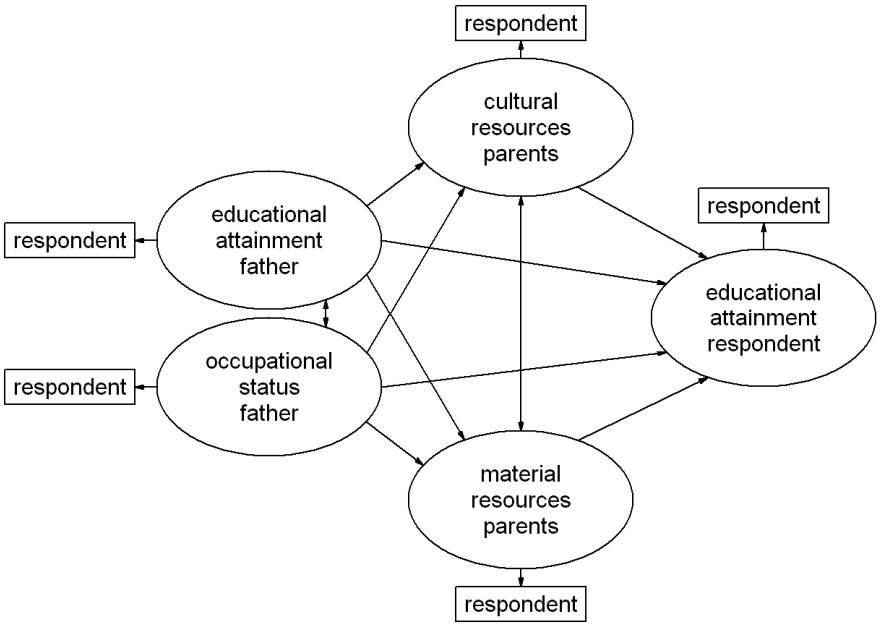
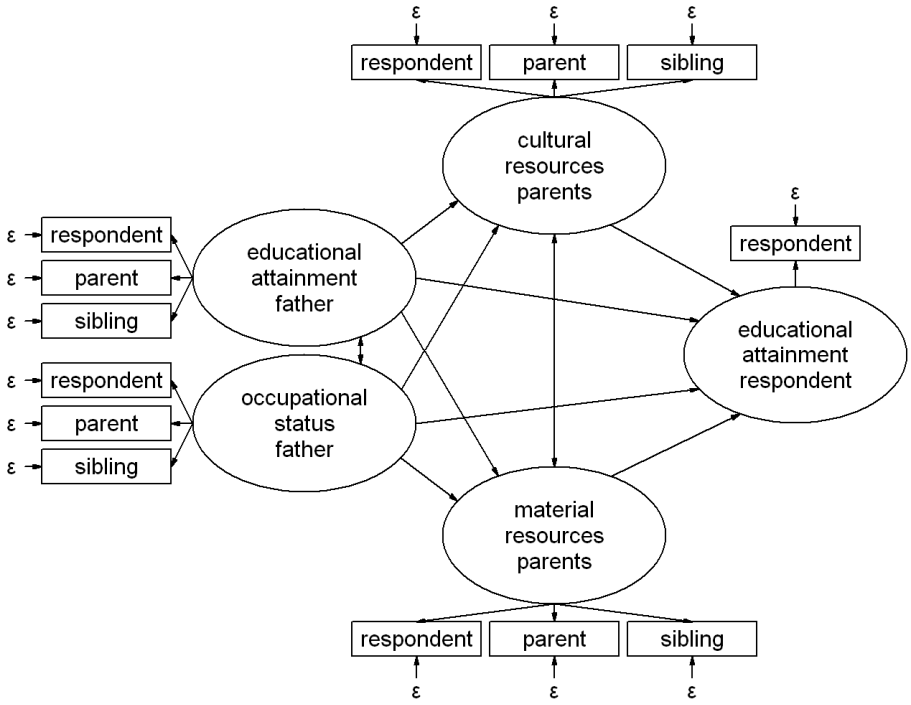


Figure 4.2 presents the educational attainment model in which father's educational attainment and occupational status, and parental material and cultural resources are measured by three indicators, based upon the three informants: the primary respondent, a parent, and one randomly selected sibling. These four variables are treated as latent variables (η_1, η_2, η_3, and η_4) each with three indicators, Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, Y_7, Y_8, Y_9, and Y_{10}, Y_{11}, Y_{12} respectively. The respondent's educational attainment, as well as the control variables respondent's birth year and sex (not shown in the graphs) have one indicator only.

Since measurement error in the reports of respondent's own educational attainment can also influence the effects of family background, we also take measurement error in this variable into account. However, we only have multiple measurements for these variables in

the 2000 survey, which implies that we cannot correct for measurement error in the full analysis. In the 2000 survey, the parents were asked about the educational attainment of their children. On the basis of the correlations between the parental reports and the respondent reports, we set the reliability of educational attainment to .85. This is in line with Hope, Schwartz, and Graham (1986), Hauser, Tsai, and Sewell (1983), and Bielby, Hauser, and Featherman (1977a, 1977b, 1977c). A reliability of .85 implies that about 15 percent of the variance in educational attainment is error variance (1-r). We computed the (unstandardized) error variance by hand (Hayduk, 1987) and included the estimate in the measurement model. Further, we perform a sensibility analysis by re-estimating the models, setting the error variance at 10 and 20 percent. We assume that respondent's birth year and sex are not subject to measurement error, since previous research showed that these variables are measured almost perfectly reliably (Schreiber, 1975/1976; Porst and Zeifang, 1987; Poulain, Riandey, and Firdion, 1992). The outcomes of this model will be compared with the effects of Model 1.

Figure 4.2 Model with random measurement error



The correlated measurement error model (Model 3) is graphically represented in Figure 4.3. We will test whether respondent's report on father's educational attainment is directly linked to the respondent's own educational attainment. This would mean that there is some correlated measurement error. Furthermore, we will investigate whether respondents and

siblings make father's education, father's occupation and parental cultural and material resources more consistent than they really are. These types of correlated measurement error will then be controlled for by the inclusion of error covariances.

Figure 4.3 Model with correlated measurement error

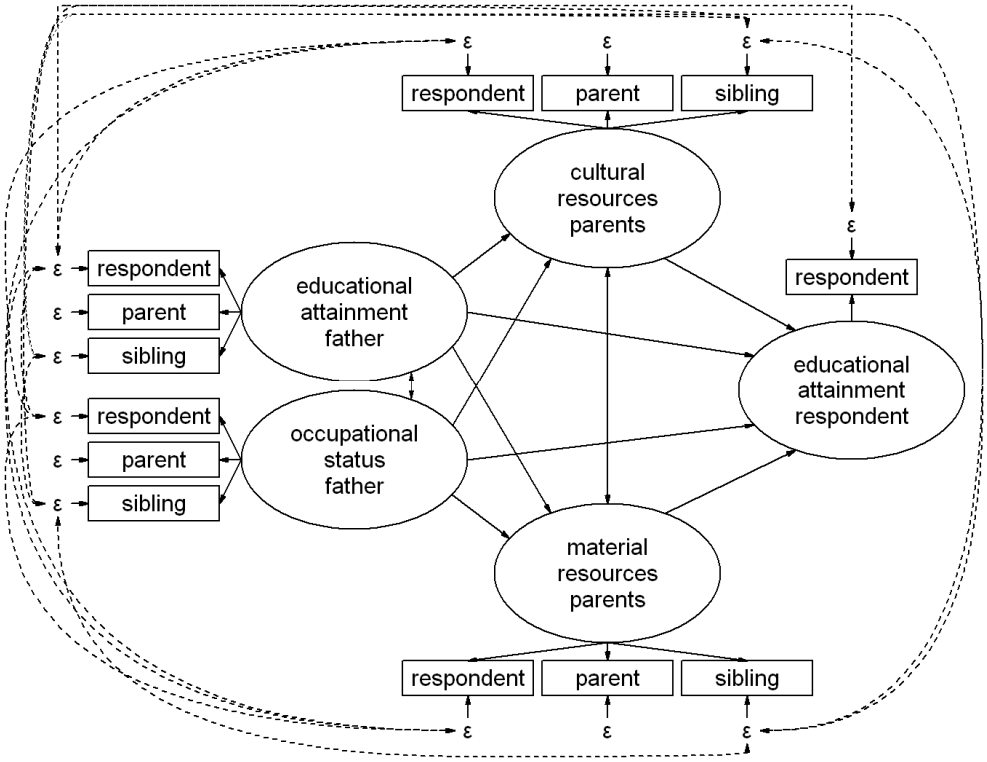
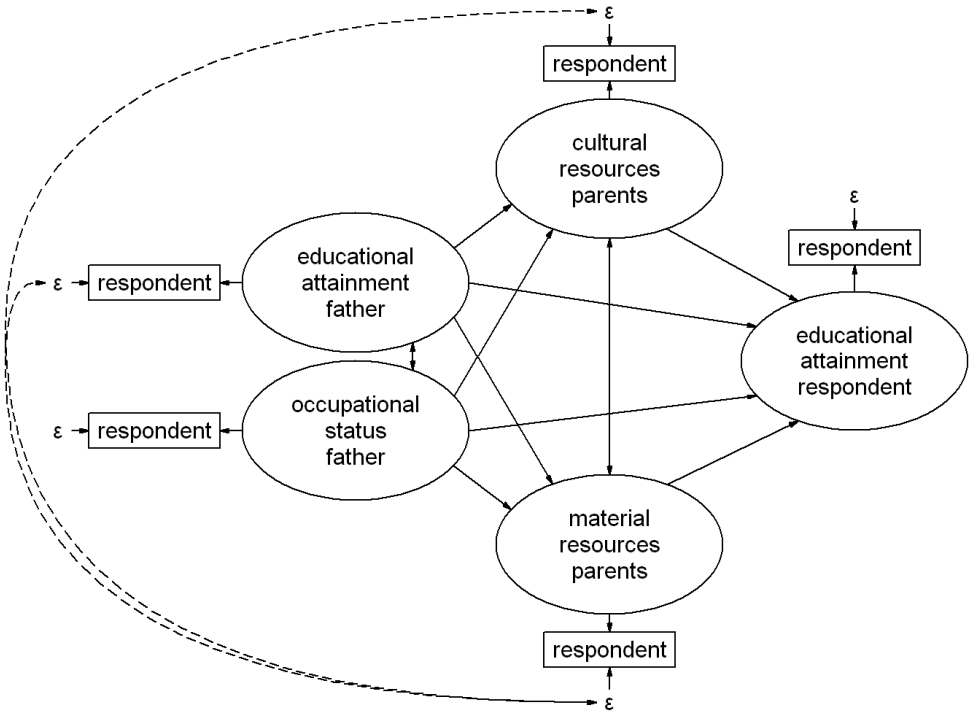


Figure 4.4 represents Model 4, which uses only information provided by primary respondents. Still, measurement error in their answers, as estimated in Model 2 and 3, is incorporated. This is done in the same way as when we incorporated measurement error in respondent's educational attainment in Model 2 and 3. In this way, we show how our information on measurement error can be used to correct for error if only respondent information is present.

The model fit is evaluated with three fit statistics, namely Chi-square, BIC, and RMSEA. The Chi-square statistic tests whether the model represents the data (or can predict the data) in a good way. If the Chi-square is not significant ($p > .05$), the model is assumed to fit the data. However, if the sample is large, the Chi-square often becomes significant, although the model does not misfit the data. The BIC and the RMSEA take the sample size into account. If the BIC value (Raftery, 1993; 1995) is below zero, the estimated model is better than the saturated model. For large models, estimating more effects (and hence losing degrees of freedom) is less likely to improve the BIC value although it could improve the Chi-

Figure 4.4 Model with imputed measurement error



square statistic. The RMSEA (Root Mean Square Error of Approximation) is the average error per degree of freedom. A value below .05 is usually considered to imply a good fit (Browne and Cudeck, 1993).

4.3.2 Approach to missing values

In Section 4.2 we showed that we have missing values for the parent and sibling indicators for part of our sample. We cope with missing values by using the multiple-group option in the LISREL software. Additional information on the missing value structure in our data is presented in Table 4.4. Respondents are classified in five groups on the basis of their missing value pattern. Group A (n=203) contains the respondents for whom we have information on father's education/occupation and parental material/cultural resources from all three informants. Respondents for whom we have at least one missing informant are in the other four groups. Sibling information is missing in Group B (n=144), and parent information is missing in group C (n=337). Respondents for whom we do not have sibling information and only parent information on father's educational attainment (mainly respondents from the 1998 questionnaire) have been ranked in Group D (n=484). Group E with 1,918 respondents for

whom we have no informants other than the primary respondents is the largest category[22]. It is possible to include all five groups in one analysis in the LISREL software, since one latent variable can be measured by different numbers of indicators over groups of respondents. If there is no parent or sibling report on a given family background variable, the means and the covariances of that indicator with all other variables in the analysis are set to zero, while the variance is set to one. Further, the effect of the latent variable on this indicator is set to zero (Jöreskog and Sörbom, 1996). In addition, the regression effects are restricted to be equal across the five groups[23]. The means of the indicators (if they are not missing) in the different groups have to be restricted to be equal, if the data are missing at random (MAR) instead of missing completely at random (MCAR). Possible differences between the groups are not worrying, since this method gives reliable results if data are either MAR or MCAR (Allison, 1987). Nevertheless, these differences do deteriorate the fit statistics. Because these fit statistics test at the same time whether the model fits the data and whether missing values are MAR instead of MCAR, we also provide the fit statistic for the model where the means are not restricted to be equal. Also in Group E, in which we have included the respondents for whom we do not have additional family background information by a parent or a sibling, the estimated effects are corrected for measurement error, because the errors are restricted to be equal to those in the group of the respondents of whom we do have information from parents or siblings. More information about the treatment of missing values has been given in Section 1.5.4.

Table 4.4 Missing value structure: sample size of five subgroups

Group	Father's education and occupation and parental resources according to primary respondent	Father's education according to parents	Father's occupation and parental resources according to parents	Father's education and occupation and parental resources according to sibling	n
A	known	known	known	known	203
B	known	known	known	missing	144
C	known	missing	missing	known	337
D	known	known	missing	missing	484
E	known	missing	missing	missing	1918
Total					3086

[22] The covariance and means matrices for the groups are shown in Appendix II.
[23] The number of degrees of freedom as computed by LISREL must be corrected. The real number of degrees of freedom is 307 lower than computed, because 307 is the total number of values set to zero or one in the covariance and means matrices of the five groups (Jöreskog and Sörbom, 1996).

4.4 Model 1: No measurement error

In this section we present the structural effects in the educational process. Model 1 of Table 4.5 is the baseline model in our analysis. This model uses only the primary respondent as informant for father's educational attainment and occupational status, and parental material and cultural resources. In other words, this linear structural model corresponds with a model estimated by ordinary least square regression analysis; the only difference is that the LISREL approach presents goodness of fit statistics. Model 1 has three degrees of freedom. The Chi-square statistic is not significant. Moreover, the BIC value is below zero and the RMSEA (Root Mean Square Error of Approximation) is below .05.

The majority of the results are in line with previous research. Reproduction via material resources is present, since father's educational attainment and father's occupation status have a positive effect on material resources, and the presence of material resources has a positive effect on son's/daughter's educational attainment. However, reproduction via cultural resources is clearly stronger, because both the effects of father's educational attainment and father's occupation status on *cultural* resources and the effect of *cultural* resources on son's/daughter's educational attainment are stronger than the effects of father's educational attainment and father's occupation status on *material* resources and the effect of *material* resources on son's/daughter's educational attainment, respectively. After controlling for material and cultural resources, father's educational attainment and father's occupational status still have a significantly positive effect on son's/daughter's educational attainment. An unexpected finding is that being a woman has a negative effect on parental material resources. Although not theoretically justified, we allow this effect to be free in order to be able to investigate whether this effect is caused by measurement error.

4.5 Model 2: Random measurement error

Model 2 in Table 4.5 includes the multi-informant measurement model for father's educational attainment and occupational status, and parental material and cultural resources. The information about the model fit is ambivalent. The Chi-square is significant, both if the means in the subgroups are allowed to be free and if the means are restricted to be equal (see Section 4.3.2). This could be due to the large sample size. According to the BIC value and the RMSEA, the fit of the model is good.

A comparison of the estimates of baseline Model 1 and random measurement Model 2 shows interesting differences. In Model 2 the direct (standardized) effect of father's educational attainment on son's/daughter's educational attainment is 15 percent greater than in

Table 4.5 Effects of social background, female, and cohort on educational attainment

	Model 1 no measurement error			Model 2 random measurement error			Model 3 correlated measurement error			Model 4 imputed measurement error		
	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
Effects on parental material resources												
Father's educational attainment (6-20)	**.789**	.070	.202	**.947**	.144	.241	**.836**	.185	.214	**.719**	.153	.249
Father's occupational status (10-90)	**.089**	.014	.110	**.102**	.031	.122	**.103**	.040	.125	**.129**	.032	.070
Female	**-1.312**	.372	-.050	**-1.165**	.366	-.049	-.065	.643	-.003	-.059	.372	.000
Birth year (1937=0, 1975=38)	**.789**	.023	.503	**.764**	.023	.544	**.773**	.024	.553	**.788**	.023	.560
R square	.379			.483			.471			.478		
Effects on parental cultural resources												
Father's educational attainment (6-20)	**1.867**	.079	.433	**2.533**	.174	.617	**2.488**	.219	.606	**2.613**	.176	.569
Father's occupational status (10-90)	**.195**	.016	.219	**.148**	.036	.168	**.143**	.047	.165	**.137**	.037	.211
Birth year (1937=0, 1975=38)	**.056**	.025	.032	.009	.026	.006	.012	.026	.009	.013	.027	.017
R square	.356			.575			.555			.591		
Effects on educational attainment												
Father's educational attainment (6-20)	**.202**	.021	.209	**.240**	.051	.240	**.202**	.069	.201	**.244**	.053	.262
Father's occupational status (10-90)	**.017**	.004	.086	.002	.009	.009	.004	.010	.017	.004	.009	.003
Parental material resources (20.53-83.35)	**.015**	.005	.060	**.015**	.007	.060	**.022**	.008	.087	**.020**	.008	.072
Parental cultural resources (31.74-8.10)	**.044**	.004	.196	**.067**	.010	.275	**.072**	.011	.296	**.064**	.010	.263
Female	**-.552**	.104	-.085	**-.552**	.104	-.092	**-.567**	.105	-.094	**-.571**	.104	-.095
Birth year (1937=0,1975=38)	**.017**	.007	.044	.011	.009	.030	.006	.009	.018	.008	.009	.022
R square	.215			.286			.285			.288		
Chi-square	3.811			850.303		*479.774*	807.432		*443.296*	3.811		
df	3			308		*271*	294		*263*	3		
RMSEA	.009			.025		*.017*	.025		*.016*	.009		
BIC	-26			-1624		*-2225*	-1555		*-2182*	-26		
n	3086			3086			3086			3086		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).
Fit statistics in italic belong to a model in which the means of the indicators in the different subgroups are allowed to differ.

Model 1, but the difference is not significant[24]. However, the indirect effect of father's educational attainment via cultural resources is twice the size of that in Model 1 (.170 (.617 × .275) versus .085 (.433 × .196)). This difference is due to the fact that both the effect of father's educational attainment on cultural resources and the effect of cultural resources on son's/daughter's educational attainment are significantly ($p < .05$) stronger. The educational transmission via material resources (.014 (.241 × .060) versus .012 (.202 × .060)) is hardly stronger than in Model 1. The direct effect of father's occupational status is 90 percent smaller and is insignificant in Model 2. The indirect effects of father's occupational status via material resources (.110 × .060 = .007 in Model 1 versus .122 × .060 = .007 in Model 2) and cultural resources (.219 × .196 = .043 in Model 1 versus .168 × .275 = .046 in Model 2) are hardly stronger than in Model 1. Constraining the error variance in son's/daughter's education attainment five percentage points higher or lower does not lead to different conclusions.

In summary then, after incorporating random measurement error, the role of the cultural dimension (father's educational attainment and parental cultural resources) in the educational attainment process is even more important, while the role of economic aspects either remains the same (material resources) or disappears (father's occupational status).

4.6 Model 3: Correlated measurement error

In this section, we focus on correlated measurement error. Correlated measurement errors are measurement errors that are related to characteristics of respondents or their parents. In Table 4.6 we present a regression analysis in which the answers the primary respondents have given about the four social background variables are predicted by (i) the information the parents have provided about these variables, (ii) the information respondents gave about other parental characteristics, and (iii) in the case of father's educational attainment: the educational attainment of the respondents themselves. If there is no systematic bias, the education of the respondents, and the information that respondents gave about other parental characteristics have no effect on the information they have given about their parents.

Table 4.6 presents clear support for the presence of correlated measurement error. The answer on one parental characteristic seems to influence the answer on another parental characteristic. Seven out of twelve effects are significant. The five non-significant effects are in the expected (positive) direction. Especially answers on father's educational attainment and

[24] We computed the significance with the formula: $T = (b_1 - b_2)/\sqrt{(se_2^2 - se_1^2(var\varepsilon_2^2/var\varepsilon_1^2)}$), where b_1 and b_2 are the unstandardized regression coefficients, se_1 and se_2 are the standard errors of the regression coefficients, and $var\varepsilon_1^2$ and $var\varepsilon_2^2$ are the unexplained variances in the dependent variables (Clogg, Petkova, and Haritou, 1995).

Table 4.6 Bias of reported father's educational attainment and father's occupational status toward other background characteristics and respondent's own educational attainment

		Father's educational attainment according to respondent			Father's occupational status according to respondent			Parental material resources according to respondent			Parental cultural resources according to respondent		
Source	Variable	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
Parent	Father's educational attainment (6-20)	**.584**	.026	.609									
Parent	Father's occupational status (10-90)				**.614**	.038	.642						
Parent	Parental material resources (20.53–83.35)							**.648**	.025	.745			
Parent	Parental cultural resources (31.74–98.10)										**.483**	.037	.473
Respondent	Father's educational attainment (6-20)				**.775**	.217	.157	.171	.128	.049	**1.099**	.191	.243
Respondent	Father's occupational status (10-90)	**.025**	.005	.124				.035	.023	.049	**.125**	.042	.096
Respondent	Parental material resources (20.53–83.35)	**.021**	.006	.075	.043	.047	.031				**.101**	.036	.110
Respondent	Parental cultural resources (31.74–98.10)	**.035**	.005	.156	.064	.041	.059	.027	.026	.035			
Respondent's educational attainment (6-20)		.009	.022	.008									
R square (adjusted)		.688			.640			.637			.562		
n		897			409			539			498		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test)

parental cultural resources seem to be biased. Although we are not sure about the direction of these effects, the effects indicate that respondents judge characteristics of their parents on the basis of other parental characteristics. In this way, they make parental characteristics more consistent than they really are. Respondent's answer on father's educational attainment is not biased in the direction of respondent's educational attainment.

To correct for correlated measurement error, we let the error in respondent's educational attainment correlate with the error in the respondent's answer on father's educational attainment. Moreover, we allow errors in indicators that stem from the same informant (for example the error variance of sibling information about father's occupation and the error variance of sibling information on parental material resources) to correlate. Furthermore, in Models 1 and 2 we saw an anomalous negative effect of being a woman on parental material resources. Because this effect does not make sense from a theoretical perspective, we will test whether respondent's answer on the material resources is biased by the respondent's sex. We cannot allow the measurement error in the material resources according to the respondent to correlate with the measurement error in female, since the error in female is fixed to zero. For that reason we specify a direct effect of female on respondent's information about material resources.

Again, the model fit statistics provide ambivalent information. The Chi-square is significant, but the BIC value is negative and the RMSEA is below .05. Furthermore, according to the Chi-square, Model 3 fits the data better than Model 2, while according to the BIC, Model 2 is to be preferred.

Table 4.7 presents the covariances of errors in the answers (of respondents and siblings) on father's educational attainment, father's occupational status, parental material resources, and parental cultural resources. The answer on father's educational attainment is correlated with the answer on parental material resources, both for respondents and siblings. Moreover, sibling's answers on father's educational attainment and cultural resources are related, just as sibling's answers on father's occupational status and material resources. The relation between respondent's answer on material resources and respondent's answer on cultural resources is on the borderline of significance ($p < .06$).

The bias toward characteristics of respondents is shown in Table 4.8. Information on father's educational attainment is not biased toward respondent's educational attainment. However, respondent's answer on material resources is biased by sex: women underestimate material resources or men overestimate material resources, or both.

Model 3 in Table 4.5 shows that taking correlated measurement error into account does not lead to different conclusions than when taking only random measurement error into consideration. The majority of effects in Model 3 are the same as in Model 2. Two exceptions are worth mentioning. First, correcting for the bias in material resources by female, makes the effect of female on material resources disappear. This is due to the fact that the negative effect of being a woman on parental material resources in Model 1 and 2 is caused by the

overestimation of parental material resources by men (or the underestimation by women). Second, the effect of material resources on educational attainment is 45 percent stronger after correcting for measurement error. However, the absolute change in the standardized effect (.027) is small and not significant. The conclusions do not alter when the error variance in son's/daughter's educational attainment is five percentage points higher or lower.

Table 4.7 Correlation between errors in answers on different family background variables

	covariance	s.e.	correlation
Respondent information			
Father's educational attainment and father's occupational status	-.590	.616	-.011
Father's educational attainment and parental material resources	**1.224**	.476	.027
Father's educational attainment and parental cultural resources	.772	.638	.016
Father's occupational status and parental material resources	2.980	2.604	.014
Father's occupational status and parental cultural resources	1.271	3.322	.005
Parental cultural resources and parental material resources	4.416	2.801	.023
Sibling information			
Father's educational attainment and father's occupational status	.674	.755	.012
Father's educational attainment and parental material resources	**1.797**	.704	.042
Father's educational attainment and parental cultural resources	**1.423**	.783	.032
Father's occupational status and parental material resources	**11.101**	3.549	.051
Father's occupational status and parental cultural resources	5.137	3.848	.023
Parental cultural resources and parental material resources	2.636	3.684	.015

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

Table 4.8 Correlation between errors in answers of respondents about their parents and about themselves

	covariance	s.e.	correlation
Father's and respondent's educational attainment	.159	.168	.014
Parental material resources and female	**-1.253**	.604	-.048

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

4.7 Model 4: Imputed measurement error

We have shown that the error variances in father's educational attainment, father's occupational status and parental cultural and material resources affect the estimates of the educational attainment process in the Netherlands. For that reason, we suggest correcting the

estimates for measurement error in future research. We found, on the basis of the 2000 Family Survey Dutch Population, that for primary respondents the error variance in own educational attainment is about 15 percent. For the four paternal and parental characteristics, Table 4.9 shows the effects of the latent characteristics on their indicators. The square of the standardized effect refers to the reliability. It turns out that information on cultural resources is less reliable than answers on the other variables. Table 4.10 presents the error variance in the information provided by the three informants as a proportion of the total variance. The error proportions for the information obtained from primary respondents is between 20 and 30 percent.

Table 4.9 The effects of latent family background characteristics on their indicators

	Indicator respondent			Indicator parent			Indicator sibling		
	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized
Father's educational attainment	1.000	- -	.887	1.062	.029	.904	.999	.031	.902
Father's occupational status	1.000	- -	.871	1.101	.040	.909	1.084	.035	.915
Parental material resources	1.000	- -	.890	1.132	.043	.931	.872	.038	.788
Parental cultural resources	1.000	- -	.844	.896	.056	.759	.858	.044	.787

Note: The effects of the latent variables on the respondent-indicators are set to one

Table 4.10 The proportion of indicator error variance

	Indicator respondent	Indicator parent	Indicator sibling
Father's educational attainment	.213	.183	.164
Father's occupational status	.242	.173	.163
Parental material resources	.205	.134	.379
Parental cultural resources	.287	.423	.380

We use these proportions and the most important biases in the respondent's answers (father's educational attainment with material resources, cultural resources with material resources, and female on material resources) to correct the estimates of Model 1. The result of this correction is represented in Model 4 in Table 4.5. The success of this correction can be judged by the resemblance of the effects in Model 4 and Model 3. Although the correction is less successful than in Chapter 2, the most important differences between Model 1 and Model 3 are present in Model 4. The estimates of Model 4 show (i) that father's educational attainment has a stronger effect on cultural resources than a model without correction suggests, (ii) that cultural resources have a stronger effect on respondent's educational attainment than a model

without correction suggests, (iii) that there is no direct effect of father's occupation on respondent's educational attainment, and (iv) that the effect of sex on material resources is caused by measurement error. Therefore, from Model 4 with the imputed error variances, the same conclusions are drawn as from models with explicit controls for measurement error.

4.8 Conclusion and discussion

In this chapter we have presented and estimated models for random and correlated measurement error in an extended educational attainment model (including material and cultural resources) for the Netherlands, by using information on family background from three informants: the respondent, one of his/her parents, and one of his/her siblings. Questioning more than one family member about the same family background variables provides uswith independent information sources.

We have shown that the results that are based on the measurement error models deviate in several ways from earlier findings on the parameters of the educational attainment process in the Netherlands. We found that the model that controls for random measurement error leads to a non-significant and almost zero direct effect of father's occupational status on his children's educational attainment (while the indirect effects via parental material and cultural resources remain about the same), and leads to much greater direct and indirect effects, via cultural resources, of father's educational attainment on his children's education. The indirect effect of father's education via material resources remains more or less unchanged. It is not a new insight that in the Netherlands the cultural dimension of social inequality is stronger than the economic dimension. Still, it is surprising that the direct effect of father's occupation disappears completely. It seems that the effect of father's occupational status that is usually found is the result of insufficient control for father's educational attainment (due to measurement error).

We also found some evidence that respondents make information about father's occupational status and educational attainment, and parental material and cultural resources more consistent with each other than they are in reality. However, controls for correlated measurement error do not lead to substantially different estimates of the effects in the educational attainment model.

We conclude that random measurement errors do influence the estimates of the effects of the basic status attainment model in the Netherlands. Moreover, three correlated errors (material resources with (i) female, (ii) father's educational attainment, and (iii) cultural resources) are present. Therefore, we recommend incorporating these error (co)variances (presented in Tables 4.7, 4.8, and 4.10) into future research. In summary then, taking measurement error into account led to stronger support for the presence of intergenerational educational transmission via cultural resources.

Chapter 5: Cultural consumption

Summary
In this chapter the bias caused by conventional retrospective measurement of family background variables in the effects of family background chracteristics and educational attainment on son's/daughter's cultural consumption is studied. It appears that measurement error in parental cultural consumption is related to father's educational attainment and son's/daughter's cultural consumption. Whether the transmission of cultural consumption is under- or overestimated depends on which other variables are included in the model. The effect of educational attainment on cultural consumption is greater after correcting for measurement error, than in analyses without correction for measurement error. In addition, this effect continues to be greater than the effect of parental cultural consumption

5.1 Introduction

This chapter focuses on the effect of parental cultural consumption on the cultural consumption of their sons/daughters. Cultural consumption is highly stratified. It is not just a leisure time activity for one's enjoyment, but also a way to obtain appreciation. Especially in the higher social classes, cultural participation is highly valued. Bourdieu (1970) argues that the elite distinguish themselves from the lower classes by participating in culture. Those who belong to the elite know how to behave at cultural events and how to discuss culture. People who do not belong to the elite and who are not culturally active do not feel at home in a higher social environment and are less accepted by the elite. This makes it more difficult to become upwardly mobile. Furthermore, because feeling at home in a cultural environment benefits one's school career, it has been argued that cultural consumption is a strategy for the elite to secure the educational career of their offspring (see Chapter 4). Since cultural participation is an important resource in society, it is important to know to what extent it is transmitted from parent to child. If this transmission is strong, society is less open. Moreover, it is relevant to ascertain whether cultural resources are mainly present among those who are already in a beneficial position in society (like the higher educated). If this is the case, accumulation of resources takes place and the inequality in a society is greater.

Family background has proven to be an important predictor of adults' cultural consumption. In some studies, family background is measured by the parents' level of education only, and in other studies it is measured more directly by parents' own cultural habits. The latter approach is more fruitful, because it yields bigger effects and because it clarifies the mechanism behind the intergenerational transmission. Children who are socialized in an environment in which culture is a standard item in the leisure time repertoire

learn how to appreciate culture or imitate their parents' life style. As soon as direct measurement of cultural socialization is included in multivariate models, the effect of parental level of education is small (Ganzeboom, 1984; Ganzeboom and De Graaf, 1991; Mohr and DiMaggio, 1995; Van Eijck, 1996). This shows that it is parental socializing practices rather than parental educational status that influences children's cultural consumption.

An important related research question is to what extent the respondent's level of education functions as an intermediate variable between parental cultural consumption and his or her own cultural consumption. Many studies find an effect of educational attainment on cultural consumption (DiMaggio and Useem, 1978; Ganzeboom, 1984; DiMaggio and Ostrower, 1990; Ganzeboom and De Graaf, 1991; Kraaykamp, 1993; Kraaykamp and De Graaf, 1995; Van Eijck, 1996). Nevertheless, research that includes both educational attainment and parental cultural consumption shows that parental cultural consumption still has a strong effect after controlling for son's/daughter's educational attainment (Ganzeboom, 1984; Ganzeboom and De Graaf, 1991; Van Eijck, 1996).

In this chapter we set out to investigate whether and to what extent the transmission of cultural capital and the role of educational attainment herein are biased because of measurement error in the retrospective account of parental cultural consumption. Such measurement error is likely to occur since respondents report about situations in the past. Respondents need to answer questions like "Did your parents go to the theatre when you were about 15 years old?". Measurement theory argues that random error in an independent variable leads to underestimating its effect. That would imply that the true association between parental and son's/daughter's cultural consumption would be higher than the reported correlation coefficients in studies that do not control for measurement error. However, in Section 1.4 we already argued that in a multivariate analysis it is possible that one of the variables can be overestimated in cases in which the effects of other variables are underestimated. Moreover, it is unsure whether measurement error in retrospective questions about parents' cultural consumption is random. It is possible that measurement error in family background characteristics is correlated to characteristics of the respondents, or that respondents make different family background characteristics more consistent with each other than they really are. Correlated measurement error would lead to an overestimation of the intergenerational transmission of cultural consumption if respondents with high levels of cultural consumption tend to overestimate the cultural consumption of their parents.

The only way to find out whether the intergenerational transmission of cultural consumption is biased by measurement error in retrospective survey questions is to do empirical research. We set out to measure parents' cultural consumption in a more reliable way, namely with multiple informants, to estimate the relevant models with this more reliable measurement, and to compare the outcomes of these models with those from conventional research. In this chapter we want to find out whether conventional research leads to reliable estimates of the intergenerational transmission of cultural consumption. We investigate this

by estimating linear structural models that include information about the parental cultural consumption when the respondent was young given by the primary respondents, one of their parents, and one of their siblings, and look at whether the model estimates differ from models in which only information of respondents is used.

5.2 Data and descriptives

5.2.1 Data

We employ the same three Dutch surveys as in Chapters 2 and 4, namely the repeated cross-sectional retrospective life-course survey Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000). In these three surveys, primary respondents and their (married or unmarried) partners were interviewed in face-to-face interviews as well as being asked to fill out self-completion questionnaires. Samples were drawn from the population registers from a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents respectively (giving a total of 4,590 respondents).

Since many of the older respondents do not have living parents, and as we want to avoid the parental source addressing respondents in a different age range than the respondent and sibling sources, we included in the analysis only respondents of 54 years or younger. Of these respondents, 86 percent had at least one parent still living at the time of the interview. In addition, about 90 percent of the respondents (in the 1992 and 2000 surveys[25]) reported having at least one living sibling. For 3,347 respondents we have valid respondent information on father's educational attainment and father's occupational status, parental cultural consumption, and on respondent's educational attainment, cultural consumption, birth year and sex.

The surveys asked respondents to give their parents' address and the address of one randomly selected sibling. The siblings and parents were then sent a questionnaire by mail, with a stamped return envelope. After two reminders, with the second one again containing the questionnaire and return envelope, completed parent questionnaires were received for 43 percent of the respondents with living parents. The response rate of siblings under respondents with at least one living sibling was 39 percent. The non-response has two causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all questionnaires contain all information we want to include in our analysis: in 1998 parents were asked only about their

education and not about their occupation and cultural consumption when the primary respondent was 15 years old, and in all three questionnaires no questions were asked about deceased spouses of the surviving parent. This means that, although we have data from 3,347 respondents between 18 and 54 years old who answered the questions about their father's education, father's occupation and parental cultural consumption, we have parent reports on father's education for 1044 respondents, parent reports on father's occupation for 453 respondents, and parent reports on parental cultural consumption for 569 respondents (for 399 respondents we have parental information on all three variables). In addition, we have sibling reports on these three family background characteristics for 663, 625, and 674 respondents, respectively (for 590 respondents we have sibling information on all three variables).

Highest completed education[26] of fathers and sons/daughters is the number of years necessary to complete the level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[27]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years. Father's occupation when the respondent was 15 years old is coded according to the International Socio Economic Index (ISEI) scale, as constructed by Ganzeboom, De Graaf, and Treiman (1992).

Parental and son's/daughter's cultural cunsumption is measured by asking questions about reading and going out to cultural events. The cultural items referring to sons and daughters are almost the same as those referring to parents. The exact items differ between the surveys. Since the items in one survey refer to activities that are more common than the items in another survey, we scaled the items within surveys. Each item was assigned a percentile score on the basis of the proportion that answered an item with yes. If 20 percent of the respondents participated in a specific activity, participating in that activity was given the score of 10 (the average of 0 and 20), while not participating was given a score of 60 (the average of 20 and 100). In this way, each item has an average score of 50, and hence all items had the same 'difficulty'. This makes different items comparable. Moreover, small cohort differences *between* the surveys are no longer present. The items have been selected on both theoretical grounds (we selected items referring to highbrow culture) and empirical grounds (we looked at which items led to the most reliable scale). The factor loadings of the items and the

[25] In the 1998 survey siblings were not questioned about their parents.
[26] The questions on all family background variables are presented in Appendix I.
[27] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.

Table 5.1 Factor loadings of the different culture items, reliability of the total scale

Variable		Parental cultural resources							Cultural resources respondent		
Survey year			1992		1998		2000		1992	1998	2000
Source:		Respon-dent	Parent	Sibling	Respon-dent	Respon-dent	Parent	Sibling	Respon-dent	Respon-dent	Respon-dent
Visit architecture		-	-	-	.697	.723	.737	.751	-	.697	.710
Visit museum of arts		.772	.734	.778	.742	.734	.794	.760	.795	.769	.751
Visit historical museum		.702	.656	.706	.639	.687	.545	.630	.667	.577	.514
Visit opera or ballet		.591	.557	.487	-	-	-	-	.630	-	-
Visit classical concert		.699	.652	.637	-	-	-	-	.714	-	-
Visit classic music, opera/ballet		-	-	-	.717	.727	.671	.707	-	.674	.681
Visit classic theatre		-	-	-	.668	.669	.700	.660	-	.627	.634
Read literary poetry		.674	.636	.573	-	-	-	-	.669	-	-
Read Dutch literature	(father)				.649	.579		.542			
	(parents)	.731	.795	.774			.643		.745	.736	.752
	(mother)				.581	.586		.644			
Read translated foreign literature		.768	.747	.780	-	-	-	-	.759	.747	.738
Read literature in foreign language	(father)				.657	.584		.558			
	(parents)	.670	.666	.645			.682		.681	-	.532
	(mother)				.586	.535		.525			
Read literature in English		-	-	-	-	-	-	-	-	.614	-
Read literature in French or German		-	-	-	-	-	-	-	-	.424	-
Cronbach's alpha		.852	.838	.832	.841	.825	.795	.831	.857	.840	.822

reliabilities of the scales are presented in Table 5.1. In the 1992 survey, the reliability of the scales is slightly higher, which may be due to the fact that in that questionnaire all items were placed in one table, which could have caused halo effects. The final score for cultural participation is the average of the different items. The alphas are between .795 and .857. Only those respondents who answered at least half of the items used obtained a valid score for the variable cultural participation.

Female is a dummy variable (0=male, 1=female). Birth year is coded as the year of birth minus 1938, the birth year of the oldest respondents in the sample.

5.2.2 Descriptives

Table 5.2 presents descriptive information about all variables in the analysis. The average paternal educational attainment is 9.43 years. Those respondents from whom we have information provided by a parent reported a somewhat higher educational level for their father. The parents themselves reported a significantly lower level of paternal educational attainment than respondents and siblings did (looking at the same group of respondents). The correlations between the answers of different informants vary from .800 to .848. Cronbach's alpha of the three answers together is high: .932.

With respect to father's occupational status, the average is 45.27. Again, this average is somewhat higher in the subgroup for whom we have parental information. The means according to the three informants do not differ significantly. The correlations between the answers of different informants are more or less the same as for father's educational attainment, namely between .792 and .862. Again, Cronbach's alpha of the three answers together is high: .930.

Looking at parental cultural consumption, the average is 50 as a result of the standardization procedure we followed. In the subgroup with parental information this mean is somewhat higher. The mean according to parents does not differ from the mean according to respondents, but the mean according to siblings is significantly lower than the means on the basis of information obtained from respondents and parents. The correlations between the three answers are lower than for father's educational attainment and occupational status, namely between .674 and .716. One could have expected the reliability to be higher for cultural consumption, since this variable is based on several items. However, these items might play a less important role in a person's life than educational attainment and occupation. As a consequence, Cronbach's alpha of the three answers together is lower too: .869.

The average of son's/daughter's educational attainment is 11.59, which is higher than that of the father. Due to the standardization of the cultural items, the score for sons/daughters cultural consumption is the same as that of parental cultural consumption, namely 50. Half of the respondents are women. The average birth year is 20.83, i.e., 1959.

Table 5.2 Descriptive information about all variables in the analysis

		n	mean	s.d.	r	α
Father's educational attainment						
(in years: range 6–20)						.932
All respondents		3347	9.43	3.40		
Respondent-parent pairs:	respondent	1044	**10.22**	3.44	.810	
	parent	1044	**10.00**	3.56		
Respondent-sibling pairs:	respondent	663	9.46	3.43	.800	
	sibling	663	9.43	3.39		
Parent-sibling pairs:	parent	325	**9.74**	3.68	.848	
	sibling	325	**10.02**	3.58		
Father's occupational status						
(ISEI: range 10-90)						.930
All respondents		3347	45.27	16.38		
Respondent-parent pairs:	respondent	453	47.60	17.08	.795	
	parent	453	47.91	17.83		
Respondent-sibling pairs:	respondent	625	46.06	16.98	.792	
	sibling	625	46.92	17.29		
Parent-sibling pairs:	parent	258	47.10	17.26	.862	
	sibling	258	47.97	17.35		
Parental cultural consumption						
(range 31.23–97.94)						.869
All respondents		3347	50.06	14.68		
Respondent-parent pairs:	respondent	569	54.48	16.08	.677	
	parent	569	54.26	15.79		
Respondent-sibling pairs:	respondent	674	**51.20**	15.05	.674	
	sibling	674	**48.50**	13.51		
Parent-sibling pairs:	parent	327	**54.28**	15.66	.716	
	sibling	327	**50.81**	14.62		
Respondent's educational attainment						
(in years: range 6-20)		3347	11.59	3.21		
Respondent's cultural resources						
(range 28.15 - 95.64)		3347	50.12	16.03		
Female						
(male=0, female=1)		3347	.51			
Birth year						
(range 1938-1982; 1938=0, 1982=44)		3347	20.83	9.37		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (two-sided test).

α = Cronbach's alpha reliability coefficient based on the three correlations.

Summing up then, if a parent participates in the survey, the means on the three background variables are higher. Moreover, parental cultural consumption is measured less reliably than father's educational attainment and occupational status.

5.3 Models

5.3.1 Approach to measurement error

We analyze the consequences of measurement error with structural equations models using the LISREL software version 8.54 (Jöreskog and Sörbom, 1996). The total effect of family background and the direct effect of family background and son's/daughter's educational attainment are estimated in three separate models (Model A, Model B, and Model C). In Model A the effects of family background (father's educational attainment, father's occupational status, and parental cultural consumption) on son's/daughter's cultural consumption are estimated. In Model B, the effect of son's/daughter's educational attainment on cultural consumption is added. Because multicollinearity turned out to be present in Model B, the effects of father's educational attainment and father's occupational status on son's/daughter's cultural consumption are discarded in Model C, while no new variables are included in Model C compared to Model B. Sex and birth year are included as covariates in all three models. Although sex differences have decreased significantly, we expect to find that women attain lower levels of educational attainment. Moreover, it has been found that women more often participate in culture than men. Excluding sex from the model would lead to an underestimation of the effect of education on cultural participation.

Each of these models is estimated four times. Model 1 includes only information provided by the primary respondents, which is considered to be measured without error. Figure 5.1 represents this model graphically. Note that this model resembles Model B, the model with the most effects.

In Model 2, which is presented graphically in Figure 5.2, we allow for random measurement error. For the family background variables this is done by treating them as latent variables, measured by the information from the three informants. Son's/daughter's own educational attainment and cultural consumption are measured by one indicator (in the case of cultural consumption, this indicator is a scale made up of several items), and measurement error is included by setting the error variance of this indicator to 15 percent and 20 percent of their total variance, respectively. Because these variables are only available for multiple informants in the 2000 survey, we can not incorporate the three measurements into the analysis. However, on the basis of the correlations between the respondent's answer and a parent's answer, we can assess the reliability, and hence calculate the error variance (Hayduk, 1987). Another way to assess the reliability of cultural participation would be to use the alpha

Figure 5.1 Model without measurement error

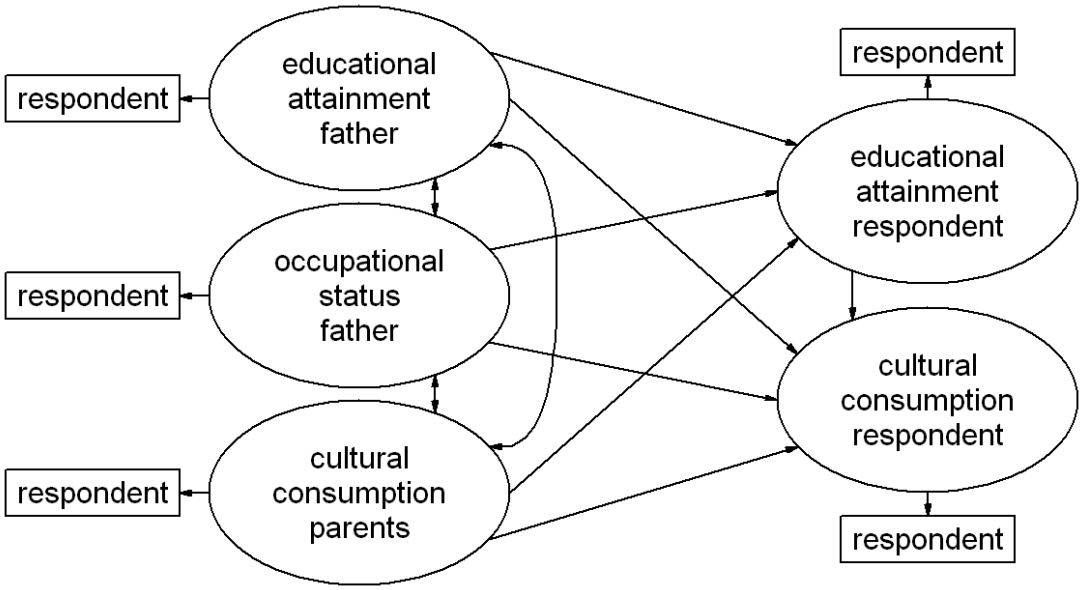
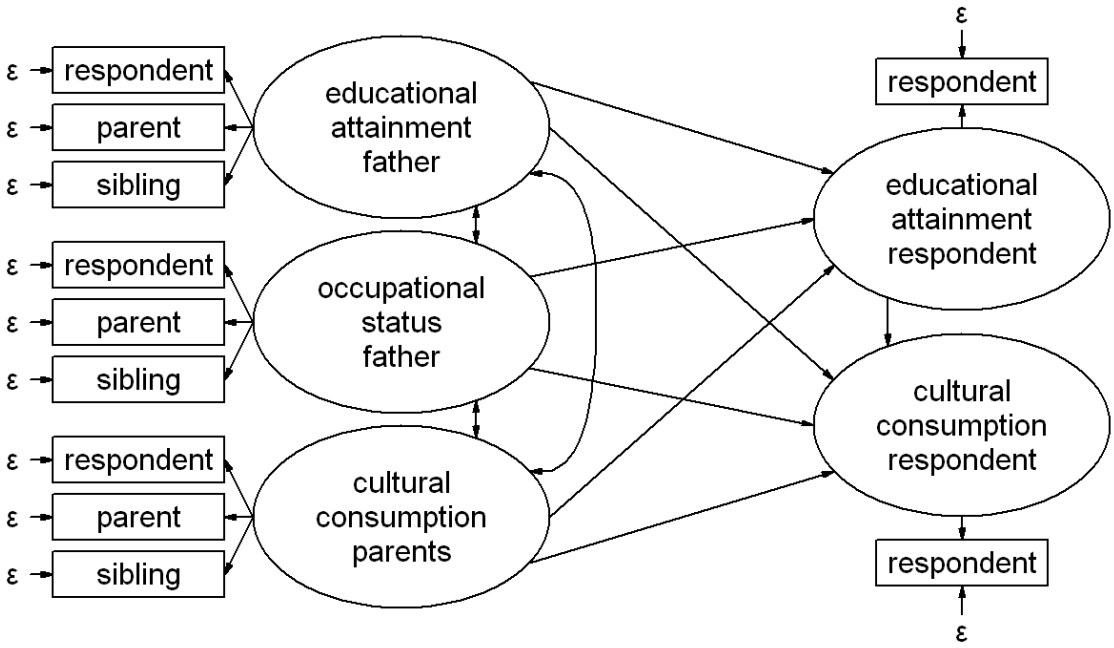


Figure 5.2 Model with random measurement error

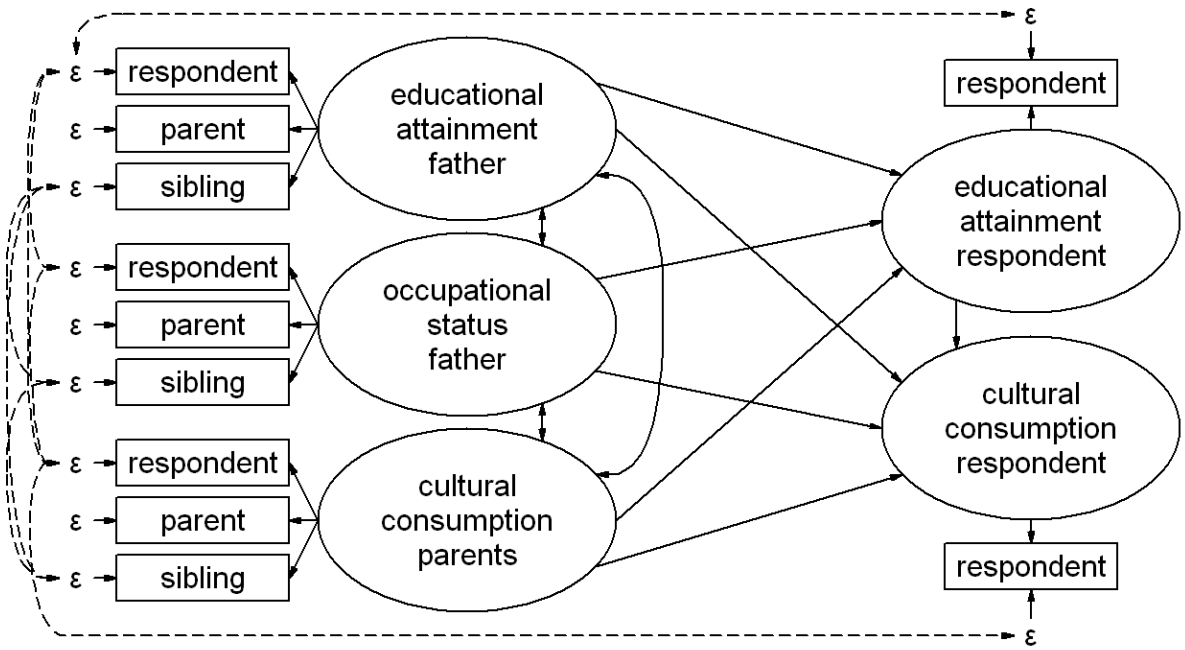


of the scale, which varied from .826 to .862 in the three surveys. However, these alphas may be overestimated due to halo effects. For that reason, we use the correlation with the parental answers about the respondents, as we have done for the other respondent characteristics. This yields a somewhat lower reliability than the alpha of the scale, namely .80. Sex and birth year

are considered to be measured without error, since previous research showed that these variables are measured reliably (Schreiber, 1975/1976; Porst and Zeifang, 1987; Poulain, Riandey, and Firdion, 1992).

Model 3 (see Figure 5.3) takes correlated measurement error into account. We test the presence of two kinds of correlated error. The first is a bias in the answers of respondents about their parents toward their own characteristics. The second is a bias of the answers of respondents and siblings about one parental characteristic toward another parental characteristic.

Figure 5.3 Model with correlated measurement error

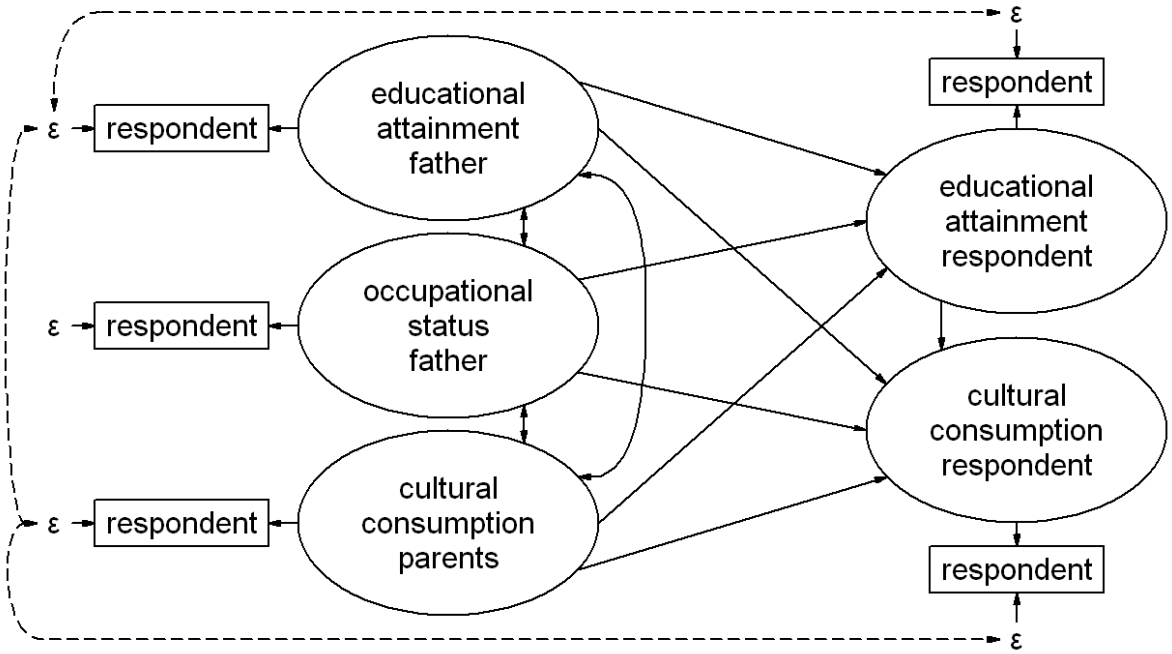


Model 4 (see Figure 5.4) only includes information provided by primary respondents, but we incorporated measurement error in the model, by constraining the error (co)variances to be equal to the values found in the second model and, if correlated error is present, to the third model. We do this to show that with the results of our analyses, future research can find the correct effects using surveys with primary respondent information only.

Three fit statistics are used to assess the model fit. The Chi-square evaluates whether the model fit is significantly worse than that of the saturated model. A disadvantage of the Chi-square is that it is frequently significant in large samples, although the model represents the data rather well. For that reason we also use two other fit statistics that take the number of cases into consideration, namely the BIC and the RMSEA. A negative value of the BIC

(Raftery, 1993; 1995) is considered to imply a good fit. For the RMSEA (Root Mean Square Error of Approximation), which is the average error per degree of freedom, a value below .05 is usually considered to imply a good fit (Browne and Cudeck, 1993).

Figure 5.4 Model with imputed measurement error



5.3.2 Approach to missing values

Unfortunately, we do not have complete information for all respondents, and therefore the model is estimated using the multiple-group option in the LISREL software (Jöreskog and Sörbom, 1996). On the basis of the missing value pattern, five groups can be distinguished (Table 5.3). Group A (n=225) consists of respondents for whom we have information on father's education, father's occupation and parental cultural consumption from all three informants. In the other four groups, data of at least one informant is missing. Group B (n=174) does not have sibling information, and group C (n=365) lacks parent information. Group D (n= 569) consists of those respondents for whom we do not have sibling information and only parent information on father's educational attainment (mainly respondents from the 1998 questionnaire). Group E is the largest category. This group contains 2,014 respondents for whom we have no informants other than the primary respondents[28].

[28] The covariance and means matrices for the five groups are shown in Appendix II.

Table 5.3 Missing value structure: sample size of five subgroups

Group	Father's education and occupation and parental consumption according to primary respondent	Father's education according to parents	Father's occupation and parental consumption according to parents	Father's education and occupation and parental consumption according to sibling	n
A	known	known	known	known	225
B	known	known	known	missing	174
C	known	missing	missing	known	365
D	known	known	missing	missing	569
E	known	missing	missing	missing	2014
Total					3347

All five groups can be included in one analysis in the LISREL software, since one latent variable can be measured by different numbers of indicators over groups of respondents. The means and the covariances of that indicator with all other variables in the analysis are set to zero, and the variance is set to one if there is no parent or sibling report on a given family background variable. The effect of the latent variable on this indicator is set to zero. Further, the regression effects are restricted to be equal over the five groups[29]. If the data are missing at random (MAR) instead of missing completely at random (MCAR), the means of the indicators (if they are not missing) in the different groups have to be restricted to be equal. Possible differences between the groups are not worrying, since this method gives reliable results if data are either MAR or MCAR (Allison, 1987). However, these differences do deteriorate the fit statistics. Since these fit statistics test at the same time whether the model fits the data and whether missing values are MAR instead of MCAR, we also provide the fit statistic for the model where the means are not restricted to be equal. Note that the estimated effects are also corrected for measurement error in Group E, in which we have included the respondents for whom we do not have additional family background information by a parent or a sibling, since the errors are restricted to be equal to those in the group of respondents for whom we do have information from parents or siblings. More information about the treatment of missing values is given in Section 1.5.4.

[29] In addition, the number of degrees of freedom as computed by LISREL must be corrected. The real number of degrees of freedom is 190 and 207 lower than computed (in Model 1 and Models 2 and 3 respectively), because 190 and 207 are the total numbers of values set to zero or one in the covariance and means matrices of the five groups (Jöreskog and Sörbom, 1996).

5.4 Model 1: No measurement error

The Models 1A, 1B, and 1C in Table 5.4 explain cultural consumption without taking measurement error in the variables into account. All three models fit the data well. The Chi-square statistics are not significant, the BIC values of all three models are negative, and the RMSEA is below .05.

Most effects are in line with previous research. Model 1A, which models the effects of father's educational attainment, father's occupational status, and parental cultural consumption when the respondent was 15 years old on son's/daughter's cultural consumption, shows that the intergenerational transmission of cultural consumption is very strong. The standardized effect of parental cultural consumption is .433. Still, father's educational attainment and father's occupational status have (small) significant positive direct effects on cultural consumption. The explained variance is .269. If educational attainment is added to Model 1A, we get Model 1B. In the latter, the effect of parental cultural consumption is smaller than in the former. The effect of educational attainment is stronger than the effect of parental cultural consumption. Nevertheless, the effect of parental cultural consumption is very strong; hence, only part of this effect is mediated by educational attainment. The R square is relatively high, namely .399, which also shows that the effect of educational attainment does not simply mediate the effect of parental cultural consumption, but is additive to it. The effect of father's occupational status has disappeared, while father's educational attainment has a small but significant and unexpectedly negative effect on cultural consumption. Because this is due to multicollinearity, the effects of father's educational attainment and father's occupational status on cultural consumption are left out in Model 1C (with the exception of the exclusion of these two variables, Model 1C is the same as Model 1B). This hardly changes the effects of educational attainment and parental cultural consumption.

5.5 Model 2: Random measurement error

Models 2A, 2B, and 2C in Table 5.4 present analyses in which random measurement error is incorporated. The model fit statistics provide ambiguous information. The Chi-squares are significant, indicating a bad fit, but the BIC value is negative and the RMSEA is below .05, indicating a good fit. Since the sample size is large (3,347), we ignore the significant Chi-squares. Further, the R squares are much stronger after taking random measurement error into account.

In all three models, the effect of parental cultural consumption when the respondent was 15 years old on son's/daughter's cultural consumption is much larger than in the

Table 5.4 Effects of social background, educational attainment, female, and cohort on cultural consumption

	Model 1: no measurement error			Model 2: random measurement error			Model 3: correlated measurement error			Model 4: imputed measurement error		
	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
A. Effects on cultural consumption												
Father's educational attainment (6-20)	**.216**	.096	.046	**-.632**	.263	-.133	-.150	.300	-.031	-.164	.238	-.034
Father's occupational status (10-88)	**.056**	.018	.057	.018	.041	.017	.022	.046	.022	.021	.043	.020
Parental cultural consumption (31.23–97.94)	**.473**	.020	.433	**.818**	.065	.717	**.678**	.081	.581	**.681**	.044	.584
Female (male=0, female=1)	**4.303**	.474	.134	**4.328**	.474	.151	**4.323**	.473	.151	**4.303**	.474	.150
Birth year (1937=0, 1975=38)	**-.361**	.026	-.211	**-.377**	.028	-.247	**-.380**	.027	-.248	**-.377**	.027	-.246
R square	.269			.435			.359			.360		
Chi-square	3.668			682.299		*314.146*	662.967		*295.362*	3.668		
df	3			215		*184*	208		*177*	3		
RMSEA	.008			.026		*.015*	.026		*.015*	.008		
BIC	-21			-1063		*-1179*	-1025		*-1141*	-21		
n	3347			3347			3347			3347		
B. Effects on cultural consumption												
Father's educational attainment (6-20)	**-.179**	.088	-.038	**-1.189**	.235	-.250	**-.642**	.277	-.135	**-.793**	.218	-.166
Father's occupational status (10-88)	.020	.017	.021	.007	.037	.007	.006	.041	.006	.013	.038	.013
Parental cultural consumption (31.23–97.94)	**.385**	.018	.353	**.677**	.057	.594	**.520**	.077	.448	**.538**	.041	.462
Educational attainment (6-20)	**1.996**	.074	.400	**2.281**	.102	.471	**2.327**	.109	.481	**2.359**	.099	.487
Female (male=0, female=1)	**5.210**	.431	.163	**5.358**	.434	.187	**5.372**	.434	.187	**5.654**	.451	.187
Birth year (1937=0, 1975=38)	**-.377**	.023	-.220	**-.380**	.025	-.248	**-.385**	.025	-.252	**-.428**	.028	-.248
R square	.399			.600			.538			.541		
Chi-square	3.668			770.487		*377.323*	748.633		*355.924*	3.668		
df	3			260		*225*	252		*217*	3		
RMSEA	.008			.025		*.015*	.025		*.014*	.008		
BIC	-21			-1340		*-1449*	-1297		*-1405*	-21		
n	3347			3347			3347			3347		

Table 5.4 continued

	Model 1: no measurement error			Model 2: random measurement error			Model 3: correlated measurement error			Model 4: imputed measurement error		
	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
C. Effects on cultural consumption												
Parental cultural consumption (31.23–97.94)	**.375**	.016	.343	**.431**	.025	.393	**.348**	.031	.299	**.338**	.025	.291
Educational attainment (6-20)	**1.976**	.072	.396	**2.201**	.097	.454	**2.382**	.104	.492	**2.403**	.096	.497
Female (male=0, female=1)	**5.228**	.431	.163	**5.361**	.436	.187	**5.401**	.434	.188	**5.403**	.434	.189
Birth year (1937=0, 1975=38)	**-.383**	.023	-.224	**-.407**	.024	-.266	**-.393**	.024	-.257	**-.390**	.024	-.255
R square	.398			.548			.508			.497		
Chi-square	7.881			820.936		*427.501*	756.593		*363.930*	5.371		
df	5			262		*227*	254		*219*	5		
RMSEA	.013			.026		*.017*	.025		*.015*	.005		
BIC	-33			-1305		*-1415*	-1305		*-1413*	-35		
n	3347			3347			3347			3347		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).
fit statistics in italic belong to a model in which the means of the indicators in the different subgroups are allowed to differ.

uncorrected versions. This difference is significant[30]. The size of the change depends on the model. In Models 2A and 2B, the effects are 66 and 68 percent, respectively, larger than in Model 1A and 1B. However, these changes are partly due to a rather strong negative effect of father's educational attainment, caused by multicollinearity. In Model 2C (without the effect of father's educational attainment and occupational status), the difference (compared to Model 1C) in the effect of parental cultural consumption is much smaller (although still significant), namely 15 percent.

Moreover, the effect of father's occupational status (present in Model 1A) is no longer present in Model 2A.

Finally, the effect of educational attainment (only specified in Models B and C) is stronger than in the uncorrected versions. These differences (of 18 and 15 percent respectively) are significant. We fixed the error variance in son's/daughter's educational attainment and cultural consumption (see Section 5.3.1) at 15 and 20 percent respectively of the total variance of these variables, but we also tried values which are five percentage points higher or lower. This did not affect the conclusions.

5.6 Model 3: Correlated error

Table 5.5 gives information on correlated measurement error in the respondent answers on the three social background characteristics. This has been done by regressing the respondent answers about each background variable on (i) the parent answer on the same variable, (ii) the respondent answers on the other background characteristics, and (iii) in the case of father's educational attainment and parental cultural consumption: on respondent's educational attainment and respondent's cultural consumption respectively. If no correlated error is present, the other background variables and the respondent characteristics have no effect.

It turns out that measurement error in father's educational attainment is not related to respondent's educational attainment. However, measurement error in father's educational attainment and father's occupational status are related to each other. In addition, measurement error in parental cultural consumption is positively related to father's educational attainment, father's occupational status, and to respondent's own cultural consumption. The latter leads to an overestimation of the effect of parental consumption on respondent's consumption. In contrast to the 1998 and 2000 surveys, in the 1992 survey the questions about parental

[30] We computed the significance with the formula: $T = (b_1 - b_2)/\sqrt{(se_2^2 - se_1^2 (var_{\varepsilon 2}/var_{\varepsilon 1}))}$, where b_1 and b_2 are the unstandardized regression coefficients, se_1 and se_2 are the standard errors of the regression coefficients, and $var_{\varepsilon 1}$ and $var_{\varepsilon 2}$ are the unexplained variances in the dependent variables (Clogg, Petkova, and Haritou, 1995).

Table 5.5 Bias of reported father's educational attainment, father's occupational status, and parental cultural consumption toward characteristics of the respondent and the father/parents

Source	Variable	Father's educational attainment according to respondent			Father's occupational status according to respondent			Parental cultural resources according to respondent		
		b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
Parent	Father's educational attainment (6-20)	**.616**	.024	.639						
Parent	Father's occupational status (10-90)				**.635**	.036	.663			
Parent	Parental cultural consumption (31.23–97.94)							**.420**	.036	.412
Respondent	Father's educational attainment (6-20)				**.774**	.198	.159	**1.156**	.173	.257
Respondent	Father's occupational status (10-90)	**.026**	.005	.128				**.082**	.033	.088
Respondent	Parental cultural consumption (31.23–97.94)	.033	.005	.149	.058	.037	.055			
Respondent's educational attainment (6-20)		.010	.021	.009						
Respondent's cultural consumption (28.15 - 95.64)								**.220**	.035	.233
Respondent's cultural consumption × survey year								-.060	.054	
Survey year (0=1992, 1=2000)								2.291	2.963	.070
R square (adjusted)		.683			.651			.569		
n		1044			453			569		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

cultural consumption and respondents own cultural consumption were placed in one table. This may make the bias stronger in the 1992 surveys. We tested whether this effect is lower in the 2000 survey than in the 1992 survey. Although the interaction effect of survey year with respondent's cultural consumption is indeed negative, this effect is not significant.

Table 5.6 Correlation between errors in answers on different family background variables

	covariance	s.e.	correlation
Model A			
Respondent information			
Father's educational attainment and father's occupational status	-.367	.583	-.007
Father's educational attainment and parental cultural resources	**.954**	.570	.019
Parental cultural resources and father's occupational status	1.175	3.056	.005
Sibling information			
Father's educational attainment and father's occupational status	.401	.726	.007
Father's educational attainment and parental cultural resources	**1.751**	.760	.038
Parental cultural resources and father's occupational status	4.863	3.733	.021
Model B			
Respondent information			
Father's educational attainment and father's occupational status	-.432	.579	-.008
Father's educational attainment and parental cultural resources	.898	.564	.018
Parental cultural resources and father's occupational status	1.098	3.047	.005
Sibling information			
Father's educational attainment and father's occupational status	.513	.728	.009
Father's educational attainment and parental cultural resources	**1.855**	.757	.040
Parental cultural resources and father's occupational status	5.212	3.727	.022
Model C			
Respondent information			
Father's educational attainment and father's occupational status	-.365	.577	-.007
Father's educational attainment and parental cultural resources	**1.130**	.553	.023
Parental cultural resources and father's occupational status	1.151	2.950	.005
Sibling information			
Father's educational attainment and father's occupational status	.454	.726	.008
Father's educational attainment and parental cultural resources	**1.731**	.756	.038
Parental cultural resources and father's occupational status	5.113	3.722	.022

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

The conclusions based on Table 5.5 are only tentative, since they are based on the bold assumption that the parental answer is (almost) free of error. A better way to investigate correlated error and how they bias effects, is to allow for correlated error in the LISREL

model. Again, we tested whether the error correlation between respondent's cultural consumption and parental cultural consumption is higher in the 1992 survey, but it turned out that the error correlations do not differ significantly. The correlations between the errors in different family background characteristics are presented in Table 5.6. It appears that the errors in information on father's educational attainment and parental cultural consumption are information, although the correlation for respondent information in Model B is on the borderline of significance ($p < .06$). That this relation is stronger for sibling's answers than for respondent's answers could be due to the fact that for siblings all questions were in one (written) questionnaire, while for respondents the questions about father's educational attainment and occupation were put in an oral questionnaire and the questions about cultural consumption in a written questionnaire.

The biases of respondent's answers about father's educational attainment and parental cultural consumption towards the respondent's educational attainment and respondent's cultural consumption are given in Table 5.7. Measurement error in respondent's answer about parental cultural consumption is related to measurement error in respondent's cultural consumption in all three models. Moreover, this relation is stronger in Model C. In this model, measurement error in father's and son's/daughter's educational attainment turn out to be related to each other too, while this is not the case in Model B.

Table 5.7 Correlation between errors in answers of respondents about their parents and about themselves

	covariance	s.e.	correlation
Model A			
Parental and respondent's cultural consumption	**13.886**	6.066	.059
Model B			
Father's and respondent's educational attainment	.174	.139	.016
Parental and respondent's cultural consumption	**12.713**	5.351	.054
Model C			
Father's and respondent's educational attainment	**.275**	.130	.025
Parental and respondent's cultural consumption	**21.391**	3.689	.091

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

The structural models for which the error covariances described above (significant and nonsignificant ones) are allowed to be free are presented in Models 3A, 3B, and 3C in Table 5.4. Just as for Model 2, the fit statistics provide ambivalent information, namely significant Chi-squares, but good RMSEA and BIC values. Looking at the difference between Models

2A, B, C and Models 3A, B, C, it turns out that the Chi-squares are significantly lower in Models 3A, B, C, while the BIC values are somewhat less negative for Models 3A, B and about the same for Model 3C. The R squares are lower in Models 3A, B, C than in Models 2A, B, C. Taking correlated error into account makes the effect of parental cultural consumption smaller compared to the random measurement error model. In Models 3A and 3B, this effect is still stronger than in Models 1A and 1B; this difference is significant for Model 3A, but only on the borderline of significance for Model 3B ($p < .08$). However, in Model 3C this effect is smaller than in Model 1C, although this difference is not significant. The consequence of measurement error for the intergenerational transmission of cultural consumption clearly depends upon the model specified.

The effect of educational attainment on cultural consumption is somewhat stronger than in Models 2B and 2C and is still significantly stronger in Models 3B and 3C than in Models 1B and 1C. In Model 3B, the relative difference between the effects of educational attainment and parental cultural consumption is about the same as in Model 1B, while in Model 3C the relative difference is greater in favor of educational attainment. Additional analyses, not presented here, show that different values for the error variance in son's/daughter's educational attainment and cultural consumption (five percentage points higher and lower) do not lead to different conclusions.

5.7 Model 4: Imputed error

This chapter shows that the effects of family background and educational attainment on cultural consumption are biased due to measurement error. Because this bias can lead to an overestimation of the effect of parental cultural consumption, especially relative to the effect of son's/daughter's educational attainment, we recommend including our estimates of the error variances in future research. Based on the 2000 Family Survey Dutch Population, we found that the error variances in respondent's educational attainment and respondent's cultural consumption are about 15 and 20 percent, respectively. For father's educational attainment, father's occupational status, and parental cultural consumption, Table 5.8 shows the effects of the latent family background characteristics on their indicators. The square of the standardized effect refers to the reliability. The information on parental cultural consumption turns out to be less reliable than answers on the other variables. Table 5.9 presents the error variance in the information provided by the three informants as a proportion of the total variance. The error proportions for the information obtained from primary respondents are between 20 and 30 percent.

In Models 4A, 4B, and 4C of Table 5.4 we imputed the proportions of error variance from Table 5.9, and the significant error covariances of Tables 5.6 and 5.7 in the model with information by the respondent only, i.e., Model 1. Model 4 provides the same structural

effects as Model 3. However, since the size of the error covariance between parental cultural consumption and son's/daughter's cultural consumption depends on the estimated model, it might be difficult to decide which error covariance to use in future research.

Table 5.8 The effects of latent family background characteristics on their indicators

	Indicator respondent			Indicator parent			Indicator sibling		
	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized
Model A									
Father's educational attainment	1.000	- -	.882	1.070	.027	.910	1.020	.030	.907
Father's occupational status	1.000	- -	.866	1.113	.037	.919	1.103	.034	.915
Parental cultural resources	1.000	- -	.838	.913	.054	.759	.880	.043	.796
Model B									
Father's educational attainment	1.000	- -	.883	1.073	.027	.911	1.016	.030	.905
Father's occupational status	1.000	- -	.867	1.112	.037	.918	1.100	.034	.914
Parental cultural resources	1.000	- -	.840	.908	.053	.757	.875	.042	.793
Model C									
Father's educational attainment	1.000	- -	.881	1.077	.027	.912	1.021	.030	.906
Father's occupational status	1.000	- -	.867	1.112	.037	.918	1.100	.034	.915
Parental cultural resources	1.000	- -	.839	.903	.054	.750	.882	.042	.799

Note: The effects of the latent variables on the respondent-indicators are set to one

Table 5.9 The proportion of indicator error variance

	Indicator respondent	Indicator parent	Indicator sibling
Model A			
Father's educational attainment	.221	.172	.177
Father's occupational status	.249	.156	.162
Parental cultural resources	.298	.424	.367
Model B			
Father's educational attainment	.220	.169	.181
Father's occupational status	.248	.156	.164
Parental cultural resources	.295	.428	.370
Model C			
Father's educational attainment	.224	.168	.178
Father's occupational status	.248	.156	.164
Parental cultural resources	.297	.437	.361

5.8 Conclusion and discussion

In this chapter we have found that son's/daughter's information on parental cultural consumption contains both random measurement error that deflates its effect on son's/daughter's cultural consumption and correlated error that inflates its effect on son's/daughter's cultural consumption. Whether the effect is under- or overestimated by measurement error depends on the specific model to be estimated.

Furthermore, we have shown that the effect of educational attainment on cultural consumption is underestimated due to measurement error. After correcting for measurement error, the effect of educational attainment remains stronger than the effect of parental cultural consumption; the size of the difference depends upon the model specified.

Unfortunately, we could not investigate whether measurement error in son's/daughter's educational attainment is correlated with measurement error in son's/daughter's cultural consumption. We did find that this was the case for measurement error in son's/daughter's information about father's educational attainment and parental cultural consumption. If this correlation is also present for the respondent characteristics, we have overestimated the effect of educational attainment on cultural consumption. However, the correlation between error in respondent's information on father's educational attainment and error in respondent's information on parental cultural consumption is small. Furthermore, for own cultural consumption and educational attainment, respondents do not have to think back in time or think about someone other than themselves. Moreover, in the answers of parents, no correlation between errors in the answers on father's educational attainement and parental cultural consumption is present. Therefore we do not expect our estimation of the effect of educational attainment on cultural consumption to be substantially biased.

We conclude that, also when measurement error is taken into account, both educational attainment and parental cultural consumption have an important effect on cultural consumption, but that the effect of educational attainment is stronger.

Chapter 6: Party preference

Summary
This chapter examines whether the intergenerational transmission of political party preference is biased by retrospective and other-report measurement of family background characteristics. It turns out that the effects of father's political party preference when the respondent was 15 years old and son's/daughter's educational attainment on son's/daughter's political party preference are underestimated if measurement error is not taken into account. The role of correlated error is negligible.

6.1 Introduction

Voting behavior determines the division of power in society, which makes it an important topic of discussion in the social and political sciences. In this chapter we focus on the origins of party preference. Several characteristics influence the political party preference of voters. For example, people of the higher middle class are inclined to vote right-wing, while Catholics tend to vote for the Christian Democratic party. Moreover, there is reason to believe that family background characteristics influence party preference as well. Popkin (1991) uses a theory on 'low-information rationality' to explain why someone's voting behavior is influenced by others. Voting is a form of collective action. Voting for a party is only useful if others vote for the same party or candidate. Therefore voters look at the preferences and votes of others to determine whether it will be effective to vote for a specific party or candidate. Need (1997) extends Popkin's theory of 'low-information rationality' to explain the effect of family background on voting behavior. Investigating party programs to know which party best serves one's interests takes a lot of time; since the influence of a single vote is very small, it is not rational to invest too much time in determining which party to vote for. Because politicians inflate their promises, they do not form a reliable source for information. Instead, people base their vote on what political parties have done in the past. Parents know more about the past behavior of political parties than their children. In addition, parents are close to their sons/daughters, which makes it easy for the latter to trust them. Therefore, it is rational for sons and daughters to follow the opinions of their parents. Achen (2002) also states that the intergenerational transmission of party identification is caused by the fact that it is rational for sons and daughters to use parental party identification to know which party best serves their interests.

Many studies have been conducted to try to explain party preference, but the majority fail to examine father's or mother's characteristics. In this section we describe briefly how voting behavior in the Netherlands differs from other countries. After that, in our description

of the main factors explaining party preference, we will focus on (parental) religiosity, (parental) social class, and parental party preference. Although many studies address the effects of human values and left-right political self-placement (cf. Van der Eijk and Niemöller, 1983), these factors are not discussed here, since they mainly function as intermediary variables between the variables mentioned and party preference. We will describe which characteristics of voters themselves influence political party preference in the Netherlands. Then, we discuss parental characteristics in international research.

The study of Oppenhuis (1995), which investigates party choice in Europe for the elections of the European Parliament in 1989, shows that the Netherlands differs strongly from other European countries with respect to the determinants of voting preference. Oppenhuis analyzes fourteen 'societies', namely the twelve countries of the European Community at that time, while treating Flanders and Wallonia, and Great Britain and Northern Ireland as separate societies. Respondents were asked about the probability of them voting for each party in their country. This probability or voting preference is the dependent variable. For each party in each country, Oppenhuis performs a separate analysis, and for each country he calculates the average percentage of explained variance of the different parties in that country. The average percentage of variance that is explained by social class ranges from 4.3 to 15.9 percent over the countries involved. In the Netherlands, the variance explained by social class is the lowest among all countries investigated. With respect to religion, it turns out that this variable explains between 1.8 and 27.9 percent of the variance in voting preference. The 27.9 percent refers to Northern Ireland. In the other countries, the percentage of explained variance does not rise above 7.8 percent. The Netherlands is one of the countries with the highest level of variance explained (6.8 percent). In summary then, the Netherlands differs from other countries by a relatively strong influence of religion on voting, and a relatively weak influence of social class.

Lijphart (1968) describes the social cleavages in the Netherlands in the post WW II period. According to him, Dutch society was divided into four blocs (also called pillars, since they were vertical blocs with people from different social classes but from the same denomination or political group and therefore from the same pillar). Lijphart states that these cleavages were mainly determined by religious denomination and social class. One bloc is formed by the Roman Catholics, the overwhelming majority of whom vote for the Catholic Peoples Party (KVP). A second bloc is formed by the Protestants. The majority of them vote either for the Anti-Revolutionary Party or the Christian Historical Union (both of them Protestant parties). The different social classes are equally likely to vote for the three confessional parties. The third pillar is the secular bloc. To this bloc belong not only those without a Christian religion, but also Roman Catholics and members of the Dutch Reformed Church who do not go to church regularly. This bloc can be divided into two blocs on the basis of social class. The lower secular classes belong to the social democratic bloc that voted

for the Labor Party (PvdA), while the higher secular classes belong to the liberal bloc that vote for the Liberal Party (VVD).

Since the publication of Lijphart's study, many researchers have reported a decline in the effect of religion on voting. Van der Eijk and Niemöller (1987) state that in the Netherlands since the 1960s, membership of a denomination does not automatically lead to voting for its associated confessional party. They find strong effects of religion and SES (Social-Economic Status) on left-right voting, but these variables are no longer dominating factors. The study of De Graaf, Heath, and Need (2001), which investigates the effect of denomination on confessional voting and the effect of social class on left-wing voting in the Netherlands between 1971 and 1998, finds that church members are more likely to vote for a confessional party than non-members, with the effect being strongest for the Reformed, weakest for the Dutch Reformed, and the effect for Catholics in between. For Catholics the effect decreases gradually over time. Moreover, for all three denominations, this effect decreases in 1977, the year in which the three largest confessional parties merged into one Christian Democratic party (CDA). Furthermore, the lower classes more often vote left-wing than the higher classes. This effect decreases linearly over time. Note that, although Van der Eijk and Niemöller (1987) and De Graaf, Heath, and Need (2001) have found a decline of the influence of religion on voting in the 1960s and 1970s, Oppenhuis (1995) has found this effect to be still relatively strong in the Netherlands of 1989 compared to other European countries.

Family background characteristics can be divided into three groups: social class, religiosity, and party preference. With respect to religiosity, Need (1997) hardly finds any effect of parental denomination on confessional voting in the Netherlands, after controlling for parental party preference and own denomination. In a sibling model in which the left-right score of the preferred party is the dependent variable, parental church membership has a negative effect, after controlling for parental party preference and own denomination. In Germany, those who were brought up religiously are more likely to vote for the CDU/CSU (Becker and Mays, 2003).

Looking at social class, De Graaf and Ultee (1990) have investigated the effect of social mobility on left-right party preference in the Netherlands. People of the higher social classes are more right-wing than people of the lower social classes. However, the effect of origin (father's social class) is more important than the effect of destination (own social class). De Graaf, Nieuwbeerta, and Heath (1995) show that the party preference of socially mobile persons is in between the preference of their father's class and that of their own class in Germany, Great Britain, the Netherlands, and the United States. According to Breen and Whelan (1994), in Ireland, own class has no effect on voting for the Fianna Fáil (the largest party), while those whose father belonged to the working class have a higher probability to vote for Fianna Fáil; the latter effect is only present among the older people. For two other parties, Fine Gael and the left, own class and father's class have an equally strong effect, with

Fine Gael being more popular among the professional and managerial workers and the left among the non-skilled working class. However, after holding constant father's party preference, father's occupation has no effect on son's/daughter's party preference in the United States (Knoke, 1976), and hardly any effect on son's/daughter's party preference in Great Britain and Australia (McAllister and Kelley, 1985). For the Netherlands, Need (1997) finds no effect of father's class if parties are classified into three categories (left, right, and confessional) and if own social class and parental party preference are held constant. Using the left-right score of the preferred party as the dependent variable (in a sibling model), the effect of father's social class on left-right voting is negative, i.e., those whose father belongs to the higher classes vote more left-wing, while the effect of own social class is positive.

Addressing parental voting preference and party identification, Campbell, Converse, Miller, and Stokes (1960), Jennings and Niemi (1968, 1974), and Goldberg (1969) find a strong bivariate relation between parental party identification and the party identification of their sons and daughters in the United States. According to Knoke (1976) father's party identification is the strongest predictor of son's/daughter's party identification in a multivariate analysis. The intergenerational transmission of voting preference and party identification is also strong in Great Britain (Butler and Stokes, 1969; McAllister and Kelley, 1985; Hudson, 1995). Nieuwbeerta and Wittebrood (1995) find a strong transmission effect of parental party preference on their children in the Netherlands, while controlling for parental social class and religiosity. Although the effects of fathers and mothers are equally strong, fathers have a greater effect on their sons and mothers a greater effect on their daughters. Moreover, the transmission of political party preference is stronger if the parents are politically homogeneous. Need (1997) replicates the finding of a strong transmission of parental party preference in the Netherlands. In Germany, people are also most likely to vote for the party their father or mother voted for (Becker and Mays, 2003). In line with Nieuwbeerta and Wittebrood (1995), if both parents voted for the same party, this effect is stronger. The effects of parental characteristics decrease with the respondent's age.

Above, we noted that studies investigating the influence of family background characteristics on voting find the effects of these characteristics to be significant. However, in many studies, family background is not taken into account; a reason for this may be distrust concerning the reliability of these variables. Frequently, respondents are asked to refer to the situation when they themselves were between 12 and 15 years of age. It is plausible to assume that information respondents supply about their parents is less reliable than the information they supply about themselves, since respondents have to think back in time and have to answer questions about someone else. We have argued in Section 1.4 that one has to know whether the error is random or correlated to assess the consequences of measurement error. Random error causes an underestimation of bivariate relations. In a multivariate analysis it is possible that random measurement error leads to an overestimation of an effect if other effects are underestimated. Correlated measurement error leads to an overestimation of the relation

between the variables whose measurement errors are correlated with each other. Two kinds of correlated errors are relevant for this chapter. The first is the bias of answers on family background characteristics towards characteristics of respondents. If respondents mirror their father's party preference toward their own party preference, the level of political transmission is overestimated. The second kind of correlated errors occurs if respondents make different characteristics of their father more similar then they really are. For instance, respondents may answer that their father did not belong to a denomination because he never went to church, while in fact the father was a passive church member without the respondent knowing that.

In this chapter we address the question of to what extent the effects of family background characteristics on party preference are under- or overestimated by random and correlated measurement error in the Netherlands. The similarities in the answers of respondents, one of their parents, and one of their siblings will give us information on the reliability of the effects that have been found in earlier research in which only respondent information was available.

6.2 Previous research on the quality of variables related to party preference

We were unable to locate studies about the quality of the measurement of parental political behavior or party preferences in the past, with the exception of Need (1997). However, the measurement of current parental characteristics, and the measurement of respondent's *own* voting in the past have been investigated. Niemi (1973) discusses the reliability of students' reports on the political behavior and attitudes of their parents, in the United States. He uses information obtained from both students and their parents and assumes that the parental reports are correct. It turns out that students report higher proportions of parents who voted and also higher proportions of parents who voted Democrat than the parents themselves. The correlation between the answers of students and the answers of parents differs strongly between the issues involved. For the direction of the presidential vote it is .82, for voting turnout it is .68, for party identification it is .59, while for political interest it is only .25. The correlation seems to be higher for factual information than for attitudinal information. Over 60 percent of the incorrect answers were closer to students' own attribute, than to the parents' attribute. Furthermore, the correlation between a parental characteristic and a student's characteristic was about .10 higher if the student's answer about the parent was used than if the parent's answer was used. Goldberg (1969), who uses the same data as Niemi (1973), finds that 78.4 percent of the respondents give the same answer as their father about father's party identification.

Himmelweit, Jaeger Biberian, and Stockdale (1978) focus on the recall accuracy of reports on voting in previous elections in Great Britain using panel data (survey years: 1962, 1964, 1966, 1970, February 1974, and October 1974). The percentage of errors (inconsistent

answers between two waves and 'can't remember') is 16 percent. This increases with the length of the recall period. Those voting for the same party in different elections and those voting for the major parties, give more accurate answers. Incorrect answers are biased towards respondent's current party preference.

For the Netherlands, recall accuracy of voting in previous elections has been studied by Van der Eijk and Niemöller (1979). They use a panel in which respondents were repeatedly asked for which party they voted in the national elections of 1971, 1972, and 1977. Only 53% of the respondents gave completely consistent answers in the three years. Furthermore, there is less switching from one party to another in recall data than in the contemporary data files; it seems that with recall data people underreport switching, which is in line with Himmelweit et al. (1978). Moreover, high political involvement has a positive effect on recall accuracy. However, Van der Eijk and Niemöller only examine whether the answers are the same and not how much the parties differ when the answers are not the same.

Need (1997) showed that 90 percent of the answers of sons and daughters about parental church membership, occupation, and party preference in the past correspond to the answers of the parents themselves. Moreover, an analysis using the information provided by the parents does not lead to substantially different results than an analysis that uses the answers of sons and daughters. However, in none of the analyses is measurement error included in the model.

6.3 Data and descriptives

6.3.1 Data

The data we analyze are from the repeated cross-sectional retrospective life-course survey Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000). In these three surveys, primary respondents and their (married or unmarried) partners were interviewed in face-to-face interviews and asked to fill out self-completion questionnaires. Samples were drawn from the population registers of a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents respectively (i.e., 4,590 respondents in total).

Many of the older respondents do not have living parents and therefore we could not obtain information obtained from the parental source for these respondents. We want to avoid the parental source addressing respondents in a completely different age range than the respondent and sibling sources. For that reason, we included in the analysis only respondents

of 54 years or younger[31]. Of these respondents, 85.6 percent had at least one living parent at the time of the interview. In addition, about 89.5 percent of the respondents (in the 1992 and 2000 surveys[32]) reported having at least one living sibling. We excluded people who did not vote. For 2,304 respondents we have valid respondent information on sex, age, father's and respondent's church membership, father's and respondent's church attendance, father's and respondent's self-employment, father's and respondent's party preference, and respondent's educational attainment and occupational status.

Respondents were asked to give their parents' address and the address of one randomly selected sibling. The siblings and parents were then sent a questionnaire by mail, with a stamped return envelope. After two reminders, with the second one again including the questionnaire and a return envelope, completed parent questionnaires were obtained from 43.3 percent of the respondents with living parents. The response rate of siblings of respondents with at least one living sibling was 39.4 percent. The non-response has two causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all questionnaires contain all the information we want to include in our analysis: in 1998, parents were asked only about their church membership and not about their other characteristics when the primary respondent was 15 years old, and in all three questionnaires no questions were asked about deceased spouses of the surviving parent. This means that, although we have data on 2,304 respondents between 18 and 54 years old who gave all necessary information about themselves and their father, we have parent reports on father's church membership for 704 respondents, and parent reports on father's church attendance for 320 respondents. For 344 respondents, we have parent reports on whether the father was self-employed, while for 318 respondents we have parental information about which party the father voted for (for 285 respondents we have parental information on all four characteristics). In addition, we have sibling reports on the four paternal characteristics for 422, 463, 451, and 417 respondents, respectively (we have sibling information on all four characteristics for 361 respondents).

Although we assume that both the father and the mother play an important role in the political socialization of their children, the possible difference between the influence of fathers and mothers (on sons and daughters separately) is beyond the scope of this thesis. We restrict our analyses to characteristics of the father. For self-employment we use father's occupation since many mothers did not have a paid job[33]. For the other characteristics we use only fathers for convenience. Using paternal and maternal characteristics as separate variables

[31] We might also exclude persons under 25, since we want to use educational attainment in our model and not all respondents under the age of 25 have completed their education. However, excluding people under 25 would imply a decrease in statistical power. We also performed our analyses excluding people under 25. The results of these analyses failed to deviate from the findings presented in this chapter.
[32] In the 1998 survey, siblings were not questioned about their parents.
[33] Moreover, De Graaf and Heath (1992) showed with British data for the period 1974-1987 that a model in which husbands class is used to explain voting preference is superior to a model in which individual class is used.

may cause high collinearity (the correlations between the characteristics of the fathers and those of the mothers are greater than .80); using the average of father and mother would either imply restricting the analysis to cases for which both the paternal and maternal characteristic have no missing values, or using the paternal information and maternal information interchangeably. Another solution would be to create a higher order latent parental characteristic measured by the latent father and the latent mother characteristic. This, however, would deviate from previous research on party preference. Moreover, such an approach makes the models complex. An analysis with both the characteristics of fathers and those of mothers showed that the effects of father's characteristics are stronger. In addition, some of the previous research (Goldberg, 1969; Knoke, 1976; Need, 1997) uses only information about the father. Father's characteristics refer to the father when the respondent was 15 years old.

On the basis of previous research, we decided to examine both religious and socio-economic factors. A third factor we examine is father's party preference. For religiosity we analyze both church membership and church attendance of both the father and his adult child. Differences between denominations are not investigated. The reason is that the use of measurement models for nominal variables is not possible with the LISREL software, and that the use of other possible methods, namely loglinear models with Latent Class Analysis (Hagenaars, 1993; Vermunt, 1996), causes problems that will be discussed in the conclusion and discussion section of this chapter.

The social-economic dimension is investigated using (father's) self-employment, occupational status, and educational attainment. Since the latter two did not have an effect when they addressed the father (even in a model in which measurement error was incorporated), we applied them only for respondents.

To measure party preference, respondents were asked which political party they would vote for if an election for the national parliament were to be held today. Father's party preference[34] refers to the political party that he preferred when the respondent was 15 years old. We classified party preference using left-right scores. This classification has been used by Van der Eijk and Niemöller (1983). They review previous research on the classification of parties. The left-right dimension turns out to be the dominant one. Although most studies find at least two dimensions, there is no agreement as to what the second dimension would be (Van der Eijk and Niemöller, 1983). Left-right scores have been calculated in the same way as Van der Eijk and Niemöller did. For each party a left-right score has been calculated, on the basis of the classification by respondents in the Dutch National Election Survey (NKO). For the paternal left-right score we used the National Election survey of 1981, for the sons and daughters we used those of 1994 and 1998. The left-right scores of political parties are related to parties being confessional or not, since all confessional parties have a high score on being right-wing. For the fathers, the correlation between the left-right score and a dummy

indicating whether a political party is secular or confessional is .715, while for the respondents it is .386. The latter is probably lower due to the increase in the popularity of the secular right-wing Liberal Party.

Church membership is incorporated as a dummy variable (0 = no member of a church or religious community; 1 = member). Church attendance is the number of visits to a church per year, which is an ordinal variable that is treated as an interval one (1 = never, 2 = one or several times a year, 3 = about once a month, 4 = about once a week or more often).

Self-employment is a dummy indicator (0 = salaried employment, 1 = self-employment). People without a job are treated as missing. For respondents this variable refers to the present or last job. Highest completed education is the number of years necessary to complete the level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[35]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years. Occupational status is coded according to the International Socio Economic Index (ISEI) scale, as constructed by Ganzeboom, De Graaf, and Treiman (1992). Since women on average have a lower occupational status, a lower educational attainment, and are more likely to vote left-wing, we included sex as a control variable. Because older people are more religious and are presumably more likely to vote right-wing, we also included age as covariate.

6.3.2 Descriptives

Table 6.1 presents basic descriptive information about the variables used in the analyses. Information about father's church membership comes from three informants, and Table 6.1 reports on the similarities in the answer of three types of pairs: respondent-parent pairs (n=704), respondent-sibling pairs (n=422), and parent-sibling pairs (n=217). According to the 2,304 respondents in the analysis, the proportion of fathers belonging to a church when the respondent was 15 years old is .76. The respondents for whom we have direct information obtained from their parents or siblings, have reported somewhat higher proportions for their father's church membership (.79 and .80). Further, it turns out that parents report a 5 percentage points lower proportion than primary respondents; a significant difference ($p<.05$) according to a paired sample T-test. This difference could be due to question formulation. In Dutch survey research, different types of questions on church membership are used. In the

[34] The questions on all family background variables are presented in Appendix I.
[35] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.

surveys we use, the one-and-a-half stage and the two-stage question are used. In the one-and-a-half stage question, people are asked whether they belong to a denomination and to which denomination they belong (the two questions are posed at once), while in the two-stage question respondents are first asked whether they belong to a denomination and if so, to which denomination they belong[36]. People might more easily say that they belong to a church when a one-and-a-half stage question is asked than when a two-stage question is asked. In the surveys used here, the respondents were asked a one-and-a-half stage question, the parents were asked a two-stage question, while the siblings were asked a one-and-a-half stage question in the 1992 survey and a two-stage question in the 2000 survey (see Appendix I). The correlation between the answers given by the respondents and their parents is .699. We examined whether the difference in question formulation influenced the correlation, by comparing pairs who were asked the same question with pairs who were asked different questions. It turned out that the correlation was not affected by question formulation. The proportions according to respondents and according to siblings do not differ from each other, and the correlation between their answers is .726. For the parent-sibling pairs, the averages do not differ significantly either, and the correlation is the same as for the respondent-sibling pair. Cronbach's alpha reliability coefficient for father's church membership based on the information from the three informants is .884.

Focusing on father's church attendance when the respondent was 15 years old, it turns out that respondents and siblings report father's church attendance to be lower than parents do, while the averages according to respondents and siblings do not differ from one another. The correlation coefficients for the three pairs of informants are higher for father's church attendance than for father's church membership, namely .871, .841, and .886, and the overall reliability coefficient is .951.

With respect to father's self-employment when the respondent was 15 years old, respondents report the proportion to be higher than their parents. The correlation coefficients for the three pairs of informants are .815, .798 and .856, and the overall reliability coefficient is .933.

Addressing father's party preference when the respondent was 15 years old, the subgroups of respondents of whom parents or siblings cooperated report a slightly higher (i.e., more right-wing) party preference than the entire group of respondents. Parents report a more right-wing party preference than siblings do. The correlation coefficients for the three pairs of informants are lower than for father's church attendance, namely .751, .818, and .839, and the overall reliability coefficient is .924.

[36] A one-stage question is also possible; this implies that respondents are asked directly to which denomination they belong (without asking whether they belong to a denomination). This question type has not been used in the surveys used here.

Table 6.1 Descriptive information about all variables in the analysis

		n	mean	s.d.	r	α
Father's church membership at age 15						
(range 0-1)						.884
all respondents		2304	.76			
respondent-parent pairs:	respondent	704	**.79**		.699	
	parent	704	**.74**			
respondent-sibling pairs:	respondent	422	.80		.726	
	sibling	422	.80			
parent-sibling pairs:	parent	217	.80		.728	
	sibling	217	.83			
Father's church attendance at age 15						
(range 1-4)						.951
all respondents		2304	2.72	1.37		
respondent-parent pairs:	respondent	320	**2.76**	1.33	.871	
	parent	320	**2.87**	1.33		
respondent-sibling pairs:	respondent	463	2.90	1.32	.841	
	sibling	463	2.83	1.35		
parent-sibling pairs:	parent	201	**3.04**	1.26	.886	
	sibling	201	**2.89**	1.33		
Father self employed at age 15						
(range 0-1)						.933
all respondents		2304	.24			
respondent-parent pairs:	respondent	344	**.23**		.815	
	parent	344	**.19**			
respondent-sibling pairs:	respondent	451	.25		.798	
	sibling	451	.25			
parent-sibling pairs:	parent	208	.23		.856	
	sibling	208	.25			
Father's party preference at age 15						
(range 1.67-8.17)						.924
all respondents		2304	6.07	2.29		
respondent-parent pairs:	respondent	318	6.26	2.20	.751	
	parent	318	6.39	2.15		
respondent-sibling pairs:	respondent	417	6.30	2.19	.818	
	sibling	417	6.38	2.15		
parent-sibling pairs:	parent	185	**6.48**	2.12	.839	
	sibling	185	**6.30**	2.20		
Respondent's educational attainment						
(in years: range 6-20)		2304	11.95	3.20		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (two-sided test).

α = Cronbach's alpha reliability coefficient based on the three correlations.

Table 6.1 continued

	n	mean	s.d.	r	α
Respondent's church membership (range 0-1)	2304	.46			
Respondent's church attendance (range 1-4)	2304	1.80	1.00		
Respondent's occupational status (ISEI: range 10-90)	2304	51.31	15.70		
Respondent self employed (range 0-1)	2304	.08			
Respondent's party preference (range 2.40-8.29)	2304	5.29	1.60		
Female (male=0, female=1)	2304	.49			
Age (in years: range 18-54)	2304	39.30	8.55		

Looking at the respondent characteristics, the average educational attainment is 11.95 years. The proportion of church members is .46, which is 30 percentage points lower than the proportion among fathers, which implies a strong secularization in one generation. Respondent's church attendance is also lower than that of the father. The average occupational status is 51.31, which is about the average of the lowest and the highest possible score. The proportion of self-employed respondents is .08, which is a third of that for fathers. Several explanations are possible for this large difference. First, the number of self-employed has declined. Second, the proportion for respondents is based on both men and women. Third, young respondents might be salaried employees, but become self-employed later in life. Respondent's party preference is more left-wing than that of their fathers. About 49 percent of the respondents is female, and the average age is 39.30 years.

6.4 Models

6.4.1 Approach to measurement error

We will estimate a structural equations model to explain party preference. This model will be estimated four times and all models are estimated using the LISREL software (version 8.54, Jöreskog and Sörbom, 1996).

Figure 6.1 Model without measurement error

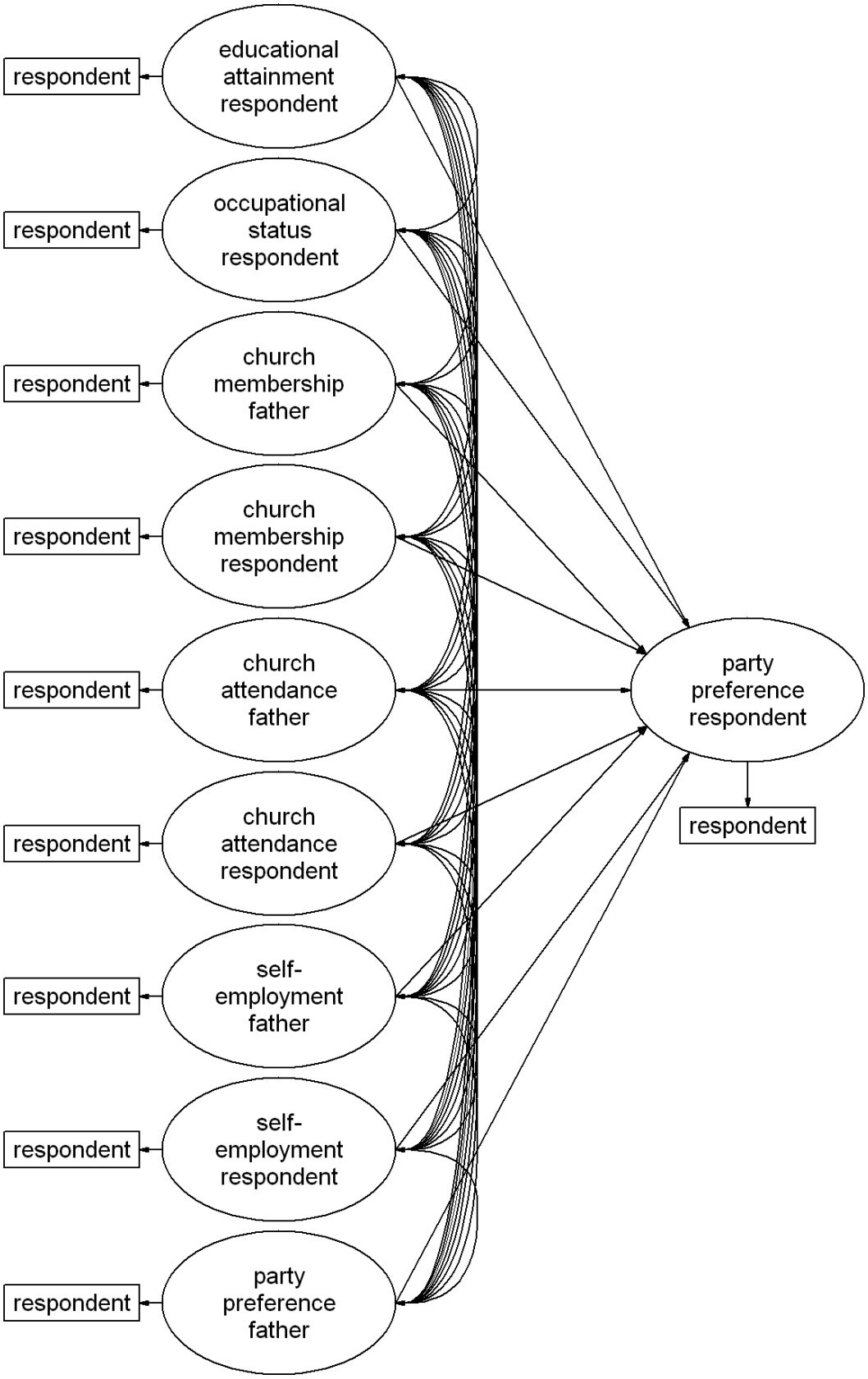


Figure 6.2 Model with random measurement error

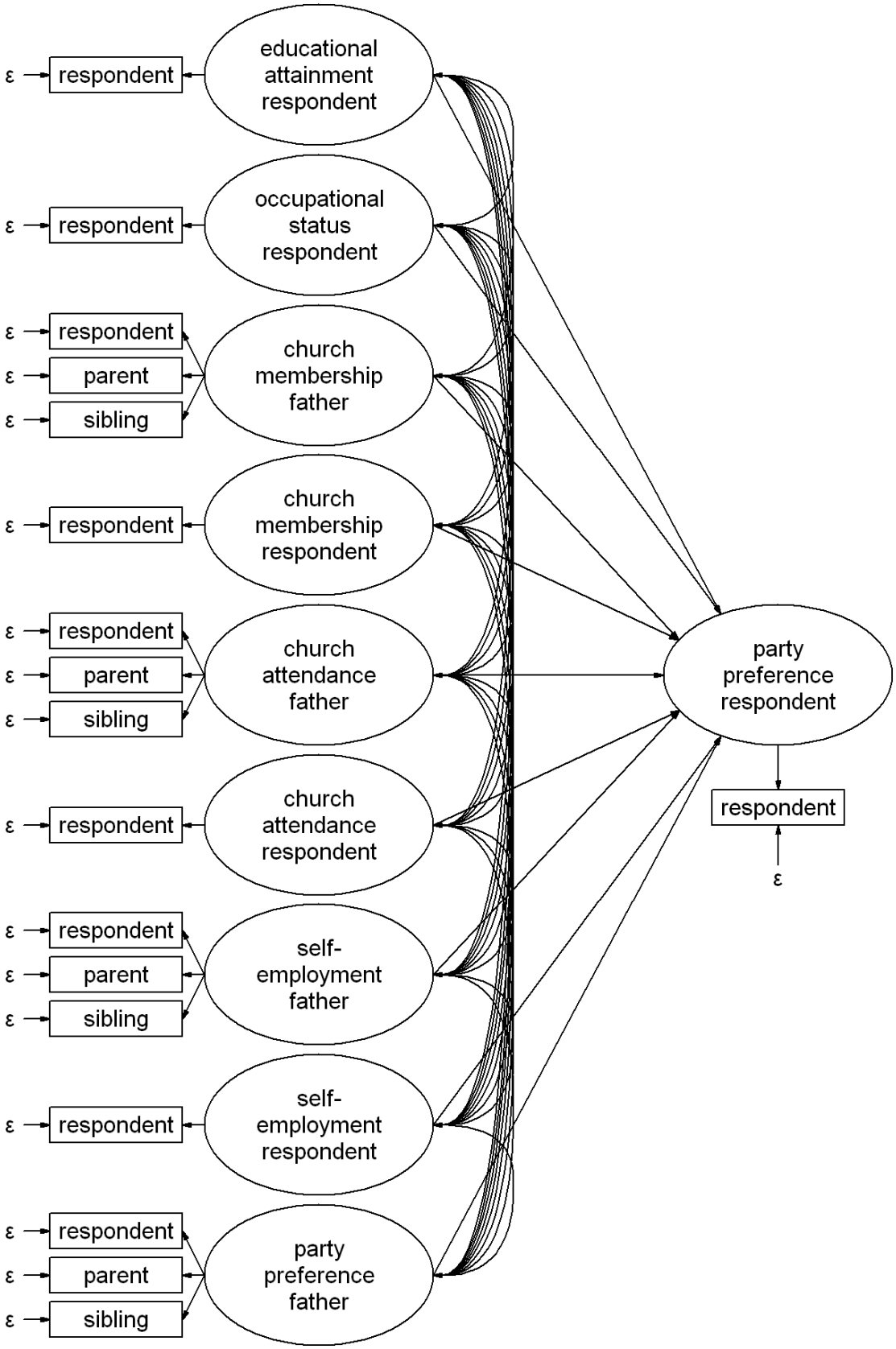


Figure 6.3 Model with correlated measurement error

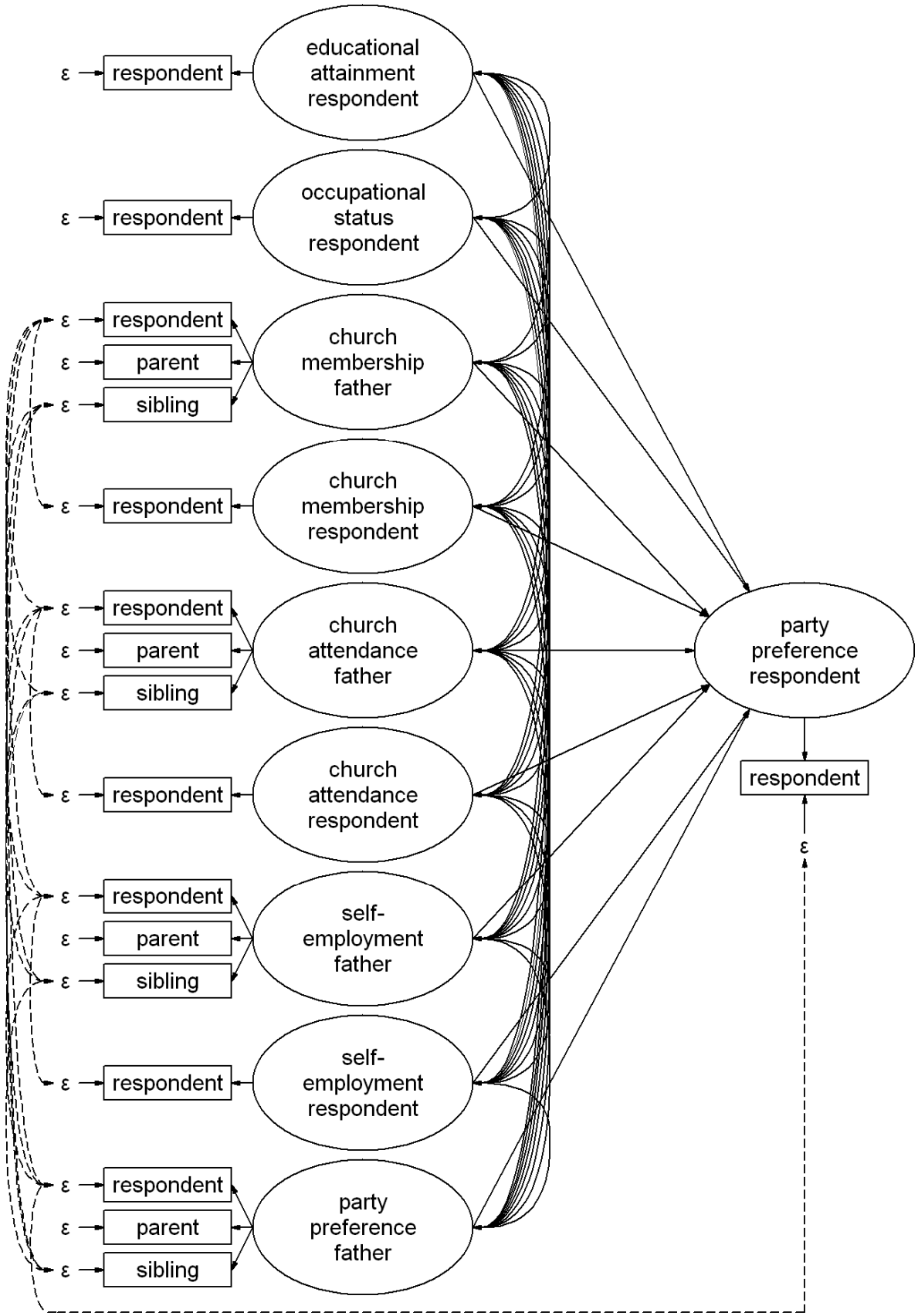
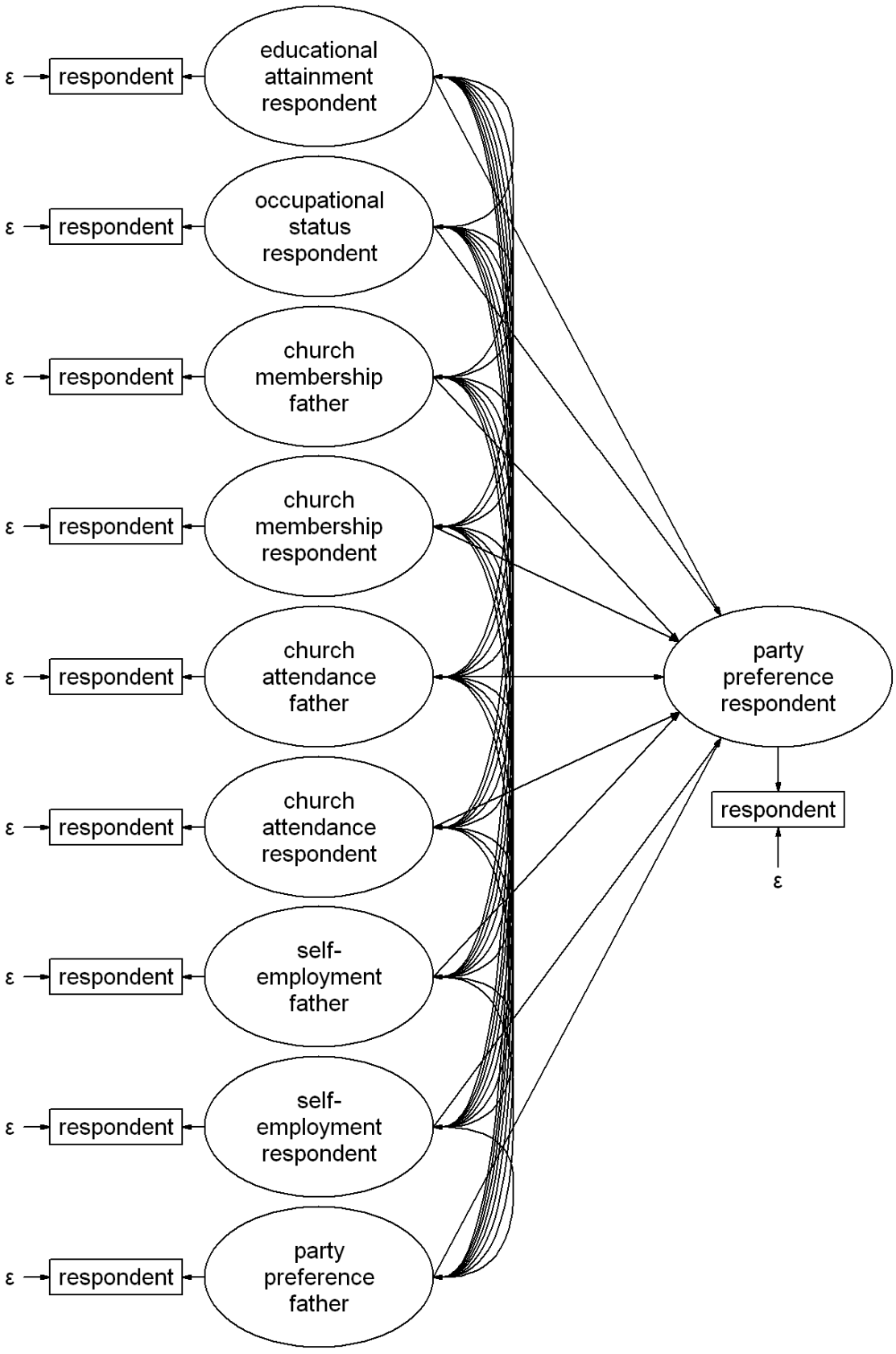


Figure 6.4 Model with imputed measurement error



In Model 1 all information used in the analysis stems from primary respondents only. This information will be assumed to be measured without error. The model is shown in Figure 6.1.

Model 2 allows for random measurement error (see Figure 6.2). Father's church membership, father's church attendance, father's self-employment, and father's party preference are treated as latent variables with three indicators each. The respondent's characteristics have one indicator only, but we will take measurement error in these variables into account too. This is done on the basis of the correlations between the answers of respondents about themselves, and the answers of the parents about the respondents in the 2000 survey. Using these correlations, we fix the reliability of educational attainment at .85, we fix the reliability of occupational status and church attendance at .80, and we fix the reliability of church membership[37], self-employment, and party preference at .75[38]. According to Hayduk (1987), this can be done for continuous and dichotomous variables by fixing the error variance at the total variance multiplied by (1 - reliability). The effects we are interested in are the structural (regression) effects. The regression effects in Model 2 will be compared with the regression effects of Model 1, which has been estimated on the family background information from the 2,304 primary respondents only.

In Model 3, displayed in Figure 6.3, correlated error is included in the model. Two types of bias are incorporated. The first is the tendency of respondents to make one's father and oneself more similar. The second bias is the tendency of respondents (and their siblings) to make the paternal characteristics more similar to each other.

Model 4 (see Figure 6.4) uses information from primary respondents only, but incorporates measurement error in this information on the basis of the results of Model 2 and Model 3. This procedure shows that it is possible to obtain correct estimates with respondent information only.

We use three fit statistics to evaluate the model fit, namely Chi-square, BIC, and RMSEA. With the Chi-square, it is possible to assess whether the estimated model deviates significantly from the saturated model. However, in large samples the Chi-square easily becomes significant. The BIC and the RMSEA solve this problem by taking the number of cases into account. A negative BIC value (Raftery, 1993, 1995) and an RMSEA (Root Mean Square Error of Approximation, Browne and Cudeck, 1993) below .05 imply a good fit.

6.4.2 Approach to missing values

In Section 6.3 we showed that parent and sibling information is not available for all respondents. For that reason we estimate the model using the multi-group option in the

[37] In contrast to the questions on father's church membership (see above) the questions on respondent's church membership were exactly the same for the different informants.

LISREL software. We distinguish five groups on the basis of the missing value structure in our data, which is shown in Table 6.2. Respondents without missing values are in Group A (n=158). The other four groups have at least one missing informant. Sibling information is missing in Group B (n=127) and parent information is missing in Group C (n=203). We have put the 386 respondents for whom we do not have sibling information and only parent information on father's church membership in Group D. The largest category is Group E with 1,430 respondents for whom we have no informants other than the primary respondents[39].

Table 6.2 Missing value structure: sample size of five subgroups

Group	Father's characteristics according to primary respondent	Father's church membership according to parents	Father's other characteristics according to parents	Father's characteristics according to sibling	n
A	known	known	known	known	158
B	known	known	known	missing	127
C	known	missing	missing	known	203
D	known	known	missing	missing	386
E	known	missing	missing	missing	1430
Total					2304

In the LISREL software it is possible to include all five groups in a single analysis, since one latent variable can be measured by different numbers of indicators over groups of respondents. If there is no parent or sibling report for a particular family background variable, the covariances of that indicator with all other variables in the analysis are set to zero, while the variance is set to one. In addition, the effect of the latent variable on this indicator is set to zero (Jöreskog and Sörbom, 1996). Further, the regression effects are restricted to be equal across the five groups[40]. The means of the indicators (if they are not missing) of the different groups have to be restricted to be equal, if the data are missing at random (MAR) instead of missing completely at random (MCAR). Possible differences between the groups are not worrying, since this method gives reliable results if the data are either MAR or MCAR (Allison, 1987). However, these differences do deteriorate the fit statistics. Since these fit

[38] We also performed analyses with a .05 lower and a .05 higher reliability. These experiments did not lead to different conclusions, albeit that the analyses with a .05 lower reliability suffered from multicollinearity.
[39] The covariance and means matrices for the five groups are shown in Appendix II.
[40] In addition, the number of degrees of freedom as computed by LISREL must be corrected. The real number of degrees of freedom is 422 lower than computed, because 422 is the total number of values set to zero or one in the covariance and means matrices of the five groups (Jöreskog and Sörbom, 1996).

statistics test at the same time whether the model fits the data well and whether missing values are MAR instead of MCAR, we also provide the fit statistic for the model that does not restrict the means to be equal. Note that in Group E, which includes the respondents for whom we do not have additional family background information by a parent or a sibling, the estimated effects are also corrected for measurement error, since the errors are restricted to be equal to those in the group of respondents for whom we do have information from parents or siblings.

6.5 Model 1: No measurement error

Model 1 in Table 6.3 presents the effects of an analysis without measurement error. Since all relations between the independent variables are allowed to be freely estimated (as in ordinary regression analysis) the model fit is perfect. The Chi-square and the number of degrees of freedom are zero, which implies that the BIC is zero as well. Since the RMSEA is the average error per degree of freedom, it cannot be calculated for this model. The R square is .160.

Father's party preference when the respondent was 15 years old has a substantial effect on respondent's party preference. This effect is the strongest of all explanatory variables. It turns out that religious respondents (i.e., both church members and church attenders) are more right-wing than non-religious respondents. The effect of church membership is stronger than that of church attendance. However, father's religiosity during socialization has an opposite effect. This is due to the fact that those who leave church vote more left-wing than non-members who never belonged to a church and the fact that we control for father's party preference (in the past). The total effect of father's religiosity on right-wing voting is positive, but this effect is mediated by his party preference. If party preference and son's/daughter's religiosity are deleted from the model, the effect of father's religiosity becomes positive.

With respect to socio-economic characteristics, respondent's occupational status has a positive effect on right-wing voting, while educational attainment has a negative effect. Since these two effects are held constant for each other, the effect of occupational status is an effect of economic status, while the effect of educational attainment is an effect of the intellectual and cultural aspects of education. Both father's and son's/daughter's self-employment have a positive effect on right-wing voting, but the effect of the latter is stronger than that of the former.

Furthermore, women are more left-wing than men, and, in contrast to our expectations, age has no effect on voting right-wing.

Table 6.3 Effects of various variables on party preference (left-right)

	Model 1 no measurement error			Model 2 random measurement error			Model 3 correlated measurement error			Model 4 imputed measurement error		
	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta	b	s.e.	beta
Effects on party preference												
Father's church membership (0-1)	**-.188**	.099	-.050	-.429	.345	-.109	-.293	.296	-.073	-.403	.446	-.102
Father's church attendance (1-4)	**-.176**	.034	-.151	**-.285**	.095	-.260	**-.285**	.088	-.258	**-.305**	.117	-.278
Father self employed (0-1)	**.154**	.076	.041	.062	.107	.017	.155	.111	.042	.044	.110	.012
Father's party preference (1.67-8.17)	**.209**	.016	.299	**.305**	.027	.451	**.273**	.037	.401	**.312**	.026	.462
Educational attainment (6-20)	**-.076**	.012	-.152	**-.108**	.018	-.229	**-.107**	.018	-.227	**-.108**	.018	-.229
Church membership (0-1)	**.478**	.087	.148	**.916**	.292	.285	**.855**	.261	.266	**.924**	.332	.287
Church attendance (1-4)	**.192**	.042	.120	.110	.129	.071	.126	.115	.081	.113	.145	.073
Occupational status (10-90)	**.006**	.002	.062	**.011**	.004	.111	**.012**	.004	.116	**.011**	.004	.108
Self employed (0-1)	**.381**	.113	.065	**.475**	.155	.081	**.473**	.154	.081	**.513**	.157	.087
Female (0-1)	**-.284**	.062	-.089	**-.297**	.063	-.107	**-.293**	.063	-.105	-.295	.064	-.106
Age (18-54)	-.006	.004	-.033	-.007	.004	-.043	-.007	.004	-.045	-.007	.004	-.041
R square	.160			.278			.254			.284		
Chi-square	0			1117.283		*776.909*	1097.969		*757.645*	0		
df	0			610		*553*	594		*537*	0		
RMSEA	-			.022		*.015*	.022		*.015*	-		
BIC	0			-3606		*-3505*	-3501		*-3400*	0		
n	2304			2304			2304			2304		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (one-sided test).
Fit statistics in italic belong to a model in which the means of the indicators in the different subgroups are allowed to differ.

6.6 Model 2: Random measurement error

Random measurement error is taken into account in Model 2 as presented in Table 6.3. The three fit statistics provide ambiguous information about the fit of the model. The Chi-square statistic is significant, but the BIC is negative and the RMSEA is below .05. The R square (.278) is much higher than in the previously discussed model without measurement error.

Compared to Model 1, two effects are significantly[41] stronger. Both the standardized effect of father's party preference when the respondent was 15 years old, the strongest effect in Model 1, and the standardized effect of educational attainment, are 51 percent stronger.

Looking at respondent's religiosity, it turns out that the positive (standardized) effect of church membership on right-wing voting almost doubles (it is 93 percent stronger), while the effect of church attendance becomes insignificant. The effect of father's religiosity in the past becomes stronger. The negative effect of father's church attendance is 60 percent stronger. The effect of father's church membership becomes insignificant, although the size is larger too. Since the correlation between church attendance and church membership is greater, one should be aware of multicollinearity. We therefore re-estimated the model without church membership. This had hardly any impact on the effect of the remaining variables.

With respect to occupational characteristics, the effect of father's self-employment during socialization disappears, respondent's self-employment is about the same, while the effect of occupational status is 79 percent stronger. However, these differences in effects are not significant[42].

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[41] We computed the significance using the formula: $T = (b_1 - b_2)/\sqrt{(se_2^2 - se_1^2(var\varepsilon_2^2/var\varepsilon_1^2)}$), where b_1 and b_2 are the unstandardized regression coefficients, se_1 and se_2 the standard errors of the regression coefficients, and $var\varepsilon_1^2$ and $var\varepsilon_2^2$ the unexplained variances in the dependent variables (Clogg, Petkova, and Haritou, 1995).

[42] Church membership and self-employment are dichotomous variables, but LISREL assumes that all variables are continuous. It is unknown to what extent the effects of these variables are biased due to the violation of the assumption of variables being continuous. We could not compute a polychoric correlation matrix, due to the fact that some of the missing value groups are too small. Moreover, other treatments of missing values (FIML or multiple imputation using the EM algorithm, Enders, 2001) could not lead to a better treatment of dichotomous variables. Since the inclusion of dichotomous variables can bias the effects of continuous variables too, we also estimated our models, without the dichotomous variables. This did not affect the changes in the effects of the other variables, except the change in the effect of father's church attendance (which becomes somewhat stronger after correction for measurement error) and the change in the effect of son's/daughter's church attendance (which becomes stronger instead of smaller after correction for measurement error). Since church attendance is strongly related to church membership, it is not remarkable that the change in the effect of church membership is accounted for by church attendance, if church membership is discarded.

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6.7 Model 3: Correlated measurement error

Correlated measurement errors can be of two kinds. First, respondents might bias answers about their father toward their own situation. Second, respondents might make several characteristics of their father more consistent with each other.

Table 6.4 presents the results of regression analyses in which the answers the primary respondents have given about the four social background variables are predicted by (i) the information the parents have provided, (ii) the characteristic of the respondents themselves, and (iii) other characteristics of the father according to the respondent. If there is no systematic bias, the characteristics of the respondents and the other characteristics of the father will not have an effect on the information they have given about the specific characteristic of the father.

According to Table 6.4, there is clear evidence of correlated measurement error for the religious background variables. Respondent's own church membership has a positive and significant effect on whether they report their father to be a member of a church in the past, and respondent's church attendance has a positive effect on their report of their father's church attendance in the past. This strongly suggests that the answers given by the respondents about father's religious background during socialization are biased in the direction of their own current religiosity. Moreover, respondents seem to bias the answers about father's church membership and father's church attendance towards each other. Furthermore, respondent information on whether the father is self-employed when the respondent was 15 years old is biased by whether the respondent is self-employed and father's party preference in the past, while the respondent answer on father's party preference is biased by the respondent report on father's church attendance.

In Model 3 of Table 6.3 our party preference model is estimated again, but now errors are allowed to correlate. The error correlations are presented in Table 6.5 and Table 6.6. In Table 6.5, the error covariance between answers (of respondents and siblings) on different paternal characteristics are given. It appears that only the errors in respondent's answers in father's church membership and father's church attendance are positively correlated with each other. Table 6.6 shows the correlations between errors in respondent answers about themselves and respondent answers about the father. Although all four error covariances are positive, only the error covariance between father's and respondent's church membership is significant.

The largest absolute difference in standardized effect between Model 2 and Model 3 is in the effect of father's party preference, which is .05 smaller (11 percent of the effect in Model 2). The difference compared to Model 1 is only on the borderline of significance ($p < .07$). Furthermore, some changes take place in the non-significant effects (father's church membership and father being self-employed). In brief, the regression effects in Model 3 do not differ substantially from the regression effects in Model 2.

Table 6.4 Bias of reported father's church membership, father's church attendance, father self-employed, and father's party preference toward characteristics of the respondent and the father

		Father's church membership according to respondent (logistic regression)		Father's church attendance according to respondent (OLS regression)			Father self employed according to respondent (logistic regression)		Father's party preference according to respondent (OLS regression)		
Source	Variable	b	s.e.	b	s.e.	beta	b	s.e.	b	s.e.	beta
Parent	Father's church membership (0-1)	**1.882**	.323								
Parent	Father's church attendance (1-4)			**.753**	.041	.754					
Parent	Father self employed (0-1)						**5.584**	.626			
Parent	Father's party preference (1.67-8.17)								**.713**	.044	.653
Respondent	Father's church membership (0-1)			**.410**	.115	.129	-1.437	.736	-.067	.257	-.013
Respondent	Father's church attendance (1-4)	**1.629**	.274				.108	.253	**.301**	.085	.182
Respondent	Father self employed (0-1)	-.698	.438	.112	.087	.035			.129	.199	.024
Respondent	Father's party preference (1.67-8.17)	.026	.065	-.008	.019	-.014	**.486**	.155			
Respondent's church membership (0-1)		**1.832**	.437								
Respondent's church attendance (1-4)				**.097**	.039	.075					
Respondent self employed (0-1)							**1.229**	.584			
Respondent's party preference (2.40-8.29)									**.087**	.051	.066
R square (adjusted)				.771					.587		
n		704		320			344		318		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (one-sided test).

Table 6.5 Correlation between errors in answers on different family background variables

	covariance	s.e.	correlation
Respondent information			
Father's church membership and father's church attendance	**.013**	.007	.023
Father's church membership and father self employed	.000	.003	.000
Father's church membership and father's party preference	.012	.013	.012
Father's church attendance and father self employed	-.004	.007	-.005
Father's church attendance and father's party preference	.029	.035	.006
Father self employed and father's party preference	.022	.014	.011
Sibling information			
Father's church membership and father's church attendance	.006	.009	.010
Father's church membership and father self employed	.001	.003	.006
Father's church membership and father's party preference	.006	.014	.007
Father's church attendance and father self employed	-.002	.008	-.003
Father's church attendance and father's party preference	-.018	.039	-.006
Father self employed and father's party preference	.007	.014	.007

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

Table 6.6 Correlation between errors in answers of respondents about their father and about themselves

	covariance	s.e.	correlation
Father's and respondent's church membership	**.008**	.003	.039
Father's and respondent's church attendance	.024	.020	.017
Father and respondent self employed	.001	.003	.007
Father's and respondent's party preference	.092	.083	.025

Note: Bold figures indicate that the difference between the means is significant at the .05 level (one-sided test).

6.8 Model 4: Imputed measurement error

To facilitate the incorporation of measurement error in future research on party preference, Table 6.7 and Table 6.8 present information on the reliability of the answers to questions about paternal characteristics. Table 6.7 shows the effects of the latent paternal characteristics on the answers of the different informants. The square of the standardized effects refer to the reliability. With respect to father's church membership, the parent information is more reliable

than the respondent/sibling information, while for party preference the parental information is less reliable. The error proportions of the indicators are presented in Table 6.8.

Table 6.7 The effects of latent paternal characteristics on their indicators

	Indicator respondent			Indicator parent			Indicator sibling		
	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized
Father's church membership	1.000	- -	.829	1.153	.037	.892	1.012	.042	.876
Father's church attendance	1.000	- -	.922	1.044	.028	.968	1.019	.031	.919
Father self employed	1.000	- -	.877	.972	.041	.919	1.054	.042	.921
Father's party preference	1.000	- -	.898	.901	.042	.856	1.001	.036	.936

Note: The effects of the latent variables on the respondent-indicators are set to one.

Table 6.8 The proportion of indicator error variance

	Indicator respondent	Indicator parent	Indicator sibling
Father's church membership	.313	.204	.232
Father's church attendance	.150	.064	.155
Father self employed	.230	.155	.152
Father's party preference	.194	.267	.124

The error proportions in father's church attendance (in the past) are about half of that in father's church membership. The reliability of father's self-employment and father's party preference is in between that of father's church membership and father's church attendance. Model 4 in Table 6.3 uses only respondent information on the paternal characteristics, but the model corrects for random measurement error using the error variances reported in Table 6.8. The effects of Model 4 are similar to those of Model 2. Those who consider the difference between Model 2 and Model 3 to be important, may question why we do not use the information on the significant error covariances in Model 4. The answer is that the only important difference between Model 2 and Model 3 is the change in the effect of father's party preference, which is caused by the error covariance of respondent answers about father's party preference and respondent's party preference. But this error covariance is not at all significant.

6.9 Conclusion and discussion

In many studies on party preference, parental characteristics are not used. This study shows that the presence of measurement error in these variables offers no good reason for excluding those variables. The effect of father's party preference is stronger than the effects of respondent characteristics. Moreover, taking measurement error into account makes this effect stronger instead of weaker.

In addition to father's party preference when the respondent was 15 years old, we also examined the implications of measurement error in father's church membership, father's church attendance, and father's self-employment during socialization, for the effects of these and other variables on adult child right-wing voting. We showed that the effect of father's church attendance becomes stronger after the inclusion of measurement error, while the effects of father's church membership and father's self-employment disappeared. We did not find sufficient support for the presence of correlated measurement error. Neither did we find support for the assumption that the errors in paternal characteristics are stronger than those in respondent's own characteristics.

In the analyses presented in this chapter, we included only continuous and dichotomous variables. Another classification of Dutch political parties is to divide them into three categories, namely left-wing, right-wing and confessional. In this way, one has a variable at the nominal measurement level. We also analyzed the data with this classification, using loglinear models with latent class analysis, which can be done with the program LEM (Vermunt, 1997). However, at present these models still have some disadvantages. First, one cannot include measurement error in the respondent characteristics if only one indicator for these characteristics is present. Second, model identification is problematic. Third, for complex models with more than 150 parameters, calculation of standard errors is currently not possible with LEM. For these reasons the parameter estimates of these models are not presented here, as the conclusions on the basis of these analyses would be provisional and tentative. Our main conclusion with respect to these models is that the effect of father's party preference is underestimated. Hence, the estimation of loglinear models with latent class analysis does not seem to lead to different conclusions than our analyses using LISREL models.

Correcting for measurement error in future research on party preference seems less obvious than in future research on status attainment, educational attainment, and cultural consumption (Chapters 2, 3, and 4, respectively). It is unclear whether and how the results found for the Netherlands can be generalized to other countries. The reliability of answers on party preference might depend upon the number of political parties in a country and upon the level of polarization of parties. If polarization is strong, party preference may be a more salient characteristic and hence be measured more reliably than if polarization is less strong.

Chapter 7: Religious disaffiliation

Summary
This chapter examines whether retrospective other-report measurement of family background variables leads to biases in the effects of these variables on leaving church. Correcting for measurement error does not lead to different conclusions. The effects of father's church attendance and educational attainment are attenuated to a small degree due to random measurement error. We do not find correlated measurement error to be present.

7.1 Introduction

Another field where family background influences behavior is religion. In most Western countries, church membership has declined during the last century (Norris and Inglehart, 2004). For that reason various researchers have investigated the underlying causes for leaving church, i.e., religious disaffiliation. Sociologists of religion claim that religious disaffiliation is not only caused by characteristics of the individuals themselves (such as educational attainment and gender), but also by characteristics of the context (characteristics of countries or municipalities such as the proportion of unchurched in a municipality), and by characteristics of the family background and parental socialization (such as parental church attendance (De Graaf, Need, and Ultee, 2000)).

Two important hypotheses on religious disaffiliation are that religious socialization decreases the probability to leave church (based on for instance social learning theory) and that rationalization in the parental home increases the probability to disaffiliate (based on secularization theory). Max Weber claimed that science would lead to an 'Entzauberung der Welt' (Norris and Inglehart, 2004). Scientific explanations are contradictory to religious explanations and make them seem superfluous. Therefore, people who grow up in a rationalized environment in which scientific explantions are common have a higher probability of leaving church. In our discussion of previous research we will split parental background characteristics into two groups: those related to religious socialization and those related to rationalization. Also, the Netherlands is a specific case because the level of religious disaffiliation is higher than in most other Western societies (De Graaf and Need, 2000). Therefore, Dutch research findings are discussed separate from those of US and Canadian studies.

Religious socialization theory claims that the more people are socialized religiously, the lower their probability of leaving church. Parents play a substantial role in the socialization of their children. An important aspect of religious socialization is *church attendance* during childhood. The assumption is that the higher the childhood church

attendance, the lower the probability of disaffiliation. Some researchers discuss parental church attendance during socialization, while others focus on own church attendance during youth or on both parental and own church attendance. Roof and Hoge (1980) find a negative effect of own church attendance during childhood on being unchurched, but only for Catholics, while for other denominations no effect is present. However, according to Hunsberger (1980, 1983) and Brinkerhoff and Mackie (1993) early church attendance has no effect on religious disaffiliation. Sherkat and Wilson (1995) show that parental church attendance and own church attendance in the past have a negative effect on disaffiliation. In the Netherlands, parental church attendance (De Graaf, Need, and Ultee, 2000) and own church attendance during childhood (Need and De Graaf, 1996; Te Grotenhuis and Scheepers, 2001) appear to have a negative effect on leaving faith as well.

Another characteristic related to religious socialization is parental *religious exogamy*. It is assumed that if one parent is non-religious, the probability of disaffiliation is higher than if both parents are religious. Moreover, if both parents belong to the same denomination, the probability of disaffiliation is assumed to be lower than if the parents belong to different denominations. For the Netherlands, Need and De Graaf (1996) find no effect of one parent being a non-member on disaffiliation, but according to De Graaf, Need, and Ultee (2000) and Te Grotenhuis and Scheepers (2001), using more recent data, this effect is positive. Need and De Graaf (1996) and Te Grotenhuis and Scheepers (2001) show that having two parents belonging to a different denomination has no effect, while in the analyses of De Graaf, Need, and Ultee (2000) religious intermarriage decreases the probability of becoming unchurched.

Religion of origin is an aspect of religious socialization about which usually no clear hypotheses are posed. Catholics have a lower probability of becoming disaffiliated than Protestants (Brinkerhoff and Mackie, 1993; Sherkat and Wilson, 1995). Conservative Protestants are less likely to become disaffiliated than liberal and mainstream Protestants (Brinkerhoff and Mackie, 1993; Sherkat and Wilson, 1995). Nevertheless, according to Sandomirsky and Wilson (1990), religion of origin does not influence religious disaffiliation. For the Netherlands, Need and De Graaf (1996) find no effect of denomination of origin, while in the more detailed analyses of De Graaf, Need, and Ultee (2000), controlling for possible effect changes over time, Catholic and Dutch Reformed people are more likely to become unchurched than orthodox reformed people. However, these differences seem to disappear over time. The finding that Catholics and Dutch Reformed are more likely to become unchurched than orthodox reformed people, has been replicated by Te Grotenhuis and Scheepers (2001).

The final aspect of religious socialization discussed here is the parental *emphasis on religion* and *religious beliefs.* The stronger the emphasis on religion and the stronger the religious beliefs of the parents, the lower the probability of disaffiliation is expected to be. These characteristics have been operationalized in several different ways. Family religious emphasis has a negative effect on becoming unchurched (Hunsberger, 1980, 1983). Roof and

Hoge (1980) report a positive effect of receiving religious training as a child on church membership among Catholics. Parents' biblical beliefs have a negative effect on disaffiliation (Sherkat and Wilson, 1995). All in all, it has been empirically corroborated that parental religious socialization decreases the probability of leaving church.

According to the secularization hypothesis, the presence of a rational worldview in the parental home increases the probability to disaffiliate. It is assumed that educational attainment enhances a more rational worldview. The effect of parental educational attainment on religious disaffiliation has been investigated by various researchers. Since people often leave church before their educational career is completed, parental educational attainment is assumed to play an important role. The higher the parental education is, the higher the probability to disaffiliate. Sherkat and Wilson (1995) report that parents' education has a positive effect on disaffiliation. In the Netherlands, Need and De Graaf (1996) and De Graaf, Need, and Ultee (2000), using the Family Survey Dutch Population (FNB), conclude that parents' education has a positive effect on disaffiliation. Te Grotenhuis and Scheepers (2001), using Social Cultural Developments in the Netherlands (SOCON), do not find an effect of parental education; in contrast to previous research they control for father's occupation. Their study shows that the father being a farmer decreases the probability of becoming unchurched.

The effects of year of birth and age are discussed simultaneously since in cross-sectional research no distinction can be made between these two variables. According to Roof and Hoge (1980), age has a positive effect on church membership. Need and De Graaf (1996) use survival analysis with life history data for the Netherlands. They find that disaffiliation is highest at the age of 19/20 years. It turns out that no cohort effect is present, but the fact that disaffiliation is highest during the years in which secularization is highest, suggests the presence of a period effect. De Graaf, Need, and Ultee (2000), also using survival analysis with life history data, show that the probability of becoming unchurched increases over time. Age has a negative effect on the probability to disaffiliate.

Finally, with respect to the effect of sex on religious disaffiliation, Sherkat and Wilson (1995) find that women have a lower probability of becoming unchurched, while in the analyses of Roof and Hoge (1980) this effect is only present among conservative Protestants. According to De Graaf, Need, and Ultee (2000), sex has no effect on leaving church in the Netherlands, but Te Grotenhuis and Scheepers (2001) conclude that women in this country have a lower probability of becoming disaffiliated. These different results might be due to different independent variables in the model.

The studies described above differ in research design. Some use local samples (Hunsberger, 1980, 1983; Brinkerhoff and Mackie, 1993), addressing only students (Hunsberger 1980, 1983), which implies that only a selective local, higher educated group from a specific birth cohort and age has been investigated. Others use a nationwide survey with people from different age and birth cohorts (Roof and Hoge, 1980; Need and De Graaf, 1996; De Graaf, Need and Ultee, 2000; Te Grotenhuis and Scheepers, 2001) and apply

survival analysis (Need en De Graaf, 1996; De Graaf, Need, and Ultee, 2000; Te Grotenhuis and Scheepers, 2001). Survival analysis has been used before by Sherkat (1991) to investigate religious switching. It has two advantages over cross-sectional analysis. First, it offers the opportunity to distinguish between the effect of age and the effect of birth year. Those who belong to later birth cohorts are more likely to leave church during their lifetime, but at the moment of observation they have had less time to do so, since they are younger than those born earlier. Second, it makes it possible to estimate the effects of characteristics that vary over the life course, and distinguish in a better way between causes and consequences. For example, the effect of education on religious disaffiliation may be biased in an ordinary cross-sectional analysis, since about half of those leaving church do so before completing their education (Need and De Graaf, 1996). However, since we treat age only as a control variable and are not interested in the distinction between birth year and age, and because we are only interested in parental characteristics and not in time-varying own characteristics, the use of a cross-sectional analysis is justified in the present study.

Testing hypotheses about the effects of parental socialization is typically done by using retrospective surveys, such as the Family Survey Dutch Population (De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000), God in Nederland (Dekker, De Hart, and Peters, 1997), and SOCON (Eisinga, Coenders, Felling, Te Grotenhuis, Oomens, and Scheepers, 2000) in which respondents answer questions about religious and socio-economic characteristics of their parents. It is likely that their answers contain measurement error, since they have to think back in time and to think about someone other than themselves. In Section 1.4 we argue that the consequences of measurement error depend upon whether error is random or correlated. Random error attenuates bivariate relations, but in a multivariate analysis it can also lead to an overestimation of effects. Two kinds of correlated error can occur. First, respondents may make different family background characteristics more consistent than they are in reality. This leads to an overestimation of the relation between these two variables, which may influence the effects of these variables on a respondent characteristic too. Second, respondents may make their father more similar to themselves than actually is the case. This leads to an overestimation of the effect of family background.

This chapter addresses the issue of the extent to which incorrect answers on family background lead to incorrect conclusions about the size of family background effects on religious disaffiliation in the Netherlands.

7.2 Data and descriptives

7.2.1 Data

The data we analyze are from the repeated cross-sectional retrospective life-course survey Family Survey Dutch Population 1992, 1998, and 2000 (Ultee and Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp, and Ultee, 1998, 2000). In these three surveys, primary respondents and their (married or unmarried) partners were interviewed in face-to-face interviews and asked to fill out self-completion questionnaires. Samples were drawn from the population registers of a representative selection of Dutch municipalities. The response rate (= contact rate × cooperation rate) was 42.5 percent in 1992, 47.3 percent in 1998, and 40.6 percent in 2000. The contact rates were about 90 percent, and the cooperation rates about 50 percent. The resulting sample sizes are 1,000, 2,029, and 1,561 respondents respectively (i.e., 4,590 respondents in total).

Since many of the older respondents do not have living parents, we could not obtain information from the parental source for these respondents. We want to avoid the parental source addressing respondents in a completely different age range than the respondent and sibling sources. For that reason, we included in the analysis only respondents of 54 years or younger. Of these respondents, 85.6 percent had at least one parent still living at the time of the interview. In addition, about 89.5 percent of the respondents (in the 1992 and 2000 surveys[43]) reported having at least one living sibling.

We excluded people for whom none of the parents was a church member at the time the respondent was 15 years old, and those who neither belonged to a denomination at the moment of the interview nor had ever belonged to a denomination (or had disaffiliated before the age of 12). These selections reduced the number of cases to 2,337 respondents for whom we have information given by the primary respondent on sex, age, father's church attendance, father's educational attainment, and respondent's church membership.

Respondents were asked to give their parents' address and the address of one randomly selected sibling. The siblings and parents were then sent a questionnaire by mail, with a stamped return envelope. After two reminders, with the second one again containing the questionnaire and a return envelope, completed parent questionnaires were received for 43 percent of the respondents with living parents. The response rate of siblings of respondents with at least one living sibling was 39 percent. The non-response has two causes: some respondents did not give the address of their parents or siblings, and some parents and siblings did not return the questionnaire they received. Not all surveys contain all the information we want to include in our analysis: in 1998, parents were asked only about their educational attainment and church membership and not about their church attendance or occupation when the primary respondent was 15 years old, and in all three surveys no questions were asked

about deceased spouses of the surviving parent. Consequently, although we have data on 2,337 respondents between 18 and 54 years old who gave all necessary information about themselves and their father, we have parent reports on father's church attendance for 343 respondents, and on father's educational attainment for 743 respondents (for 332 respondents we have parental information on both variables). In addition, we have sibling reports on the two characteristics for 522 and 509 respondents respectively (we have sibling information on both variables for 498 respondents).

Previous studies on religious disaffiliation not only differ in research design, but also with respect to the variables selected. We focus on parental characteristics and wish to investigate both the religious socialization aspect and the rationalization aspect. We use father's church attendance at respondent's age 15 to investigate the socialization aspect, and father's educational attainment to examine the rationalization dimension. Moreover, we employ sex and age as covariates. Age and birth year are highly correlated since the surveys were conducted only a few years apart (1992, 1998, and 2000). We control for age to take into account that some of the younger respondents have not yet left church, but may do so in the future[44].

Although we acknowledge that both parents play an important role in the religious socialization of their children, we restrict our analyses to the characteristics of the father, because the difference in the influence of father's and mother's is beyond the scope of this study. Moreover, using paternal and maternal characteristics as separate variables may cause high collinearity especially if the correlation between paternal and maternal characteristics is adjusted for attenuation. Using the average of father and mother would imply either restricting the analysis to respondents for which both characteristics have no missing values, or a variable that sometimes only addresses the father and sometimes only the mother, and sometimes both. This results in lower correlations between the indicators and an underestimation of their reliability. Another solution would be to create a higher order latent parental characteristic measured by the latent father and the latent mother characteristic. However, this deviates from previous research practice and forces one to use complicated models. Some scholars specialized in the sociology of religion may regard the focus on father's educational attainment and father's church attendance as a rather parsimonious approach. However, more complex models cause estimation problems. Moreover, these variables are the most important family background variables and it is important to know how reliable these background indicators are.

[43] In the 1998 survey, siblings were not questioned about their parents.

[44] Because some previous studies found effects of one parent being a non-member and father's occupation, we also attempted to analyze the effects of these variables. However, this turned out to result in unsolvable technical problems. These variables were therefore not included in the final models presented here. We will come back to this in the conclusion and discussion section of this chapter.

The variables were measured as follows[45]. Religious disaffiliation is a dummy variable (0 = stayed a church member; 1 = became unchurched). Female is a dummy variable too (0 = male, 1 = female) and age is a continuous variable.

Father's church attendance when the respondent was 15 years old is an ordinal variable (1 = never, 2 = one or several times a year, 3 = about once a month, 4 = about once a week or more often) that is considered to be interval. We did not recode this to the number of visits per year since this would make the distribution deviate more from the normal distribution.

Father's highest completed education is recoded into the number of years necessary to complete the level of education: primary school is 6 years of schooling, lower vocational training (LBO) is 9 years, lower general education (MAVO) and short intermediate vocational training (KMBO) are 10 years, normal intermediate vocational training (MBO[46]) and intermediate general education (HAVO) are 11 years, pre-university education (VWO) is 12 years, higher vocational training (HBO) is 15 years, university (WO) is 17 years, and post-university is 20 years.

7.2.2 Descriptives

Table 7.1 presents basic descriptive information on the variables used in the analysis. For all respondents in the analysis, the average church attendance of fathers is 3.20 (corresponding to category 'once a month') on a scale from 1 to 4. Information about father's church attendance comes from three informants. Table 7.1 reports on the similarities in the answers of three types of pairs: respondent-parent pairs (n=343), respondent-sibling pairs (n=522), and parent-sibling pairs (n=228). To make a good comparison between the answers of respondents and parents, we first look at the respondents for whom we have direct information by their parents. It turns out that they have reported about the same level of paternal church attendance as the total group of respondents. We subsequently compare the answers of respondents and parents. It turns out that parents have reported a somewhat higher church attendance than their sons or daughters; this difference is significant ($p<.05$) according to a paired sample T-test. The correlation between the answers given by the respondents and their parents is .764. The same approach is used for comparing the respondent answers with the sibling answers and the parents' answers with those of the siblings. The average paternal church attendance according to siblings is about the same as that according to primary respondents, and the correlation between the two answers is .733. The average according to parents is significantly higher than the average according to siblings ($p < .05$), while the correlation between the two answers is

[45] The questions on all family background variables are presented in Appendix I.
[46] MBO gets a score that is somewhat lower than the actual years necessary to complete the education, since this type of education is less advantageous than other types with the same number of years.

somewhat stronger, namely .849. The reliability coefficient Cronbach's alpha of father's church attendance is .915.

Table 7.1 Descriptive information about all variables in the analysis

		n	mean	s.d.	r	α
Father's church attendance						
(range 1-4)						.915
all respondents		2337	3.20	1.15		
respondent-parent pairs:	respondent	343	**3.13**	1.16	.764	
	parent	343	**3.29**	1.10		
respondent-sibling pairs:	respondent	522	3.27	1.10	.733	
	sibling	522	3.22	1.15		
parent-sibling pairs:	parent	228	**3.33**	1.09	.849	
	sibling	228	**3.17**	1.21		
Father's educational attainment						
(in years: range 6–20)						.923
all respondents		2337	9.14	3.24		
respondent-parent pairs:	respondent	743	**9.79**	3.29	.795	
	parent	743	**9.63**	3.43		
respondent-sibling pairs:	respondent	509	9.21	3.36	.784	
	sibling	509	9.18	3.28		
parent-sibling pairs:	parent	249	**9.48**	3.52	.818	
	sibling	249	**9.74**	3.41		
Respondent's religious disaffiliation						
(0=church member,						
1= no member, i.e., left church)		2337	.37			
Female						
(male=0, female=1)		2337	.52			
Age						
(range 18-54)		2337	39.18	8.87		

Note: Bold figures indicate that the difference between the means is significant at the .05 level (two-sided test).

α = Cronbach's alpha reliability coefficient is based on the three correlations.

Looking at the average educational attainment of fathers, this is 9.14 years according to the total group of respondents. The subgroup of respondents for whom we have a parental answer have reported a higher paternal educational attainment (9.79) than the total group of respondents. Comparing the answers of respondents and parents, it turns out that parents have reported a significantly lower level of educational attainment than their sons or daughters. The

correlation between the answers given by the respondents and their parents is .795. The average paternal educational attainment according to siblings does not differ from that according to primary respondents, and the correlation between the two answers is .784. The average according to parents is significantly lower than the average according to siblings, and the correlation between the answers is .818. The reliability coefficient Cronbach's alpha of father's educational attainment is .923.

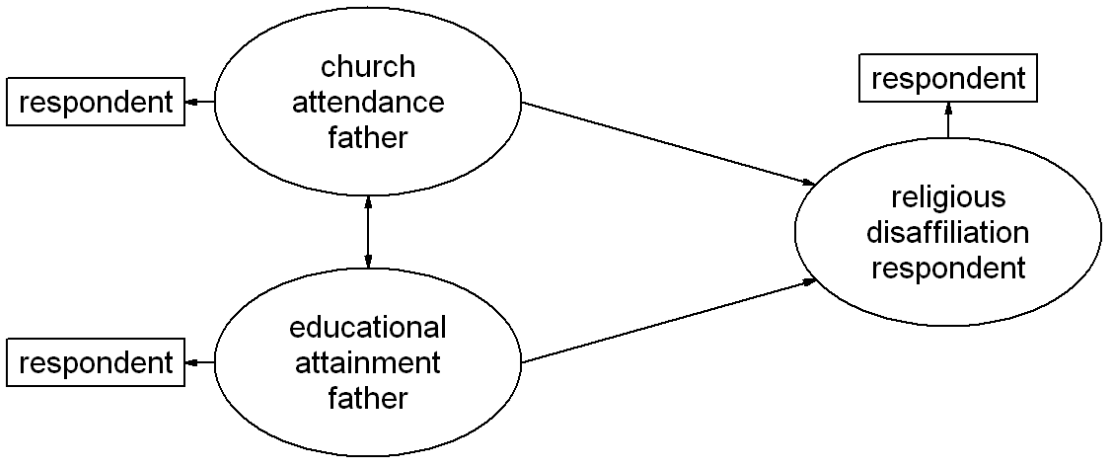
Looking at the respondent characteristics, 37 percent of the respondents have left church, 52 percent are female and the average age is 39.18 years.

7.3 Models

7.3.1 Approach to measurement error

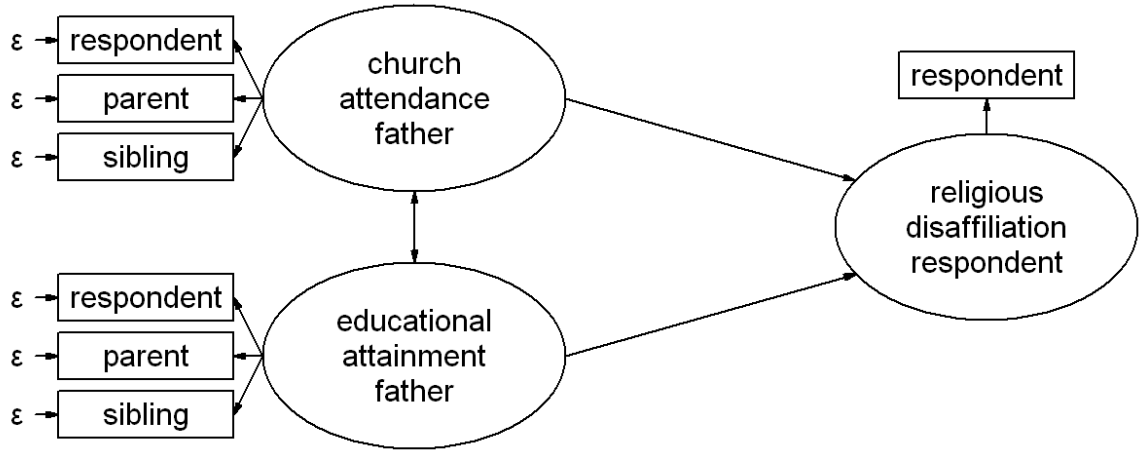
We perform a structural equation model with latent variables using the Mplus software, which is related to the better known LISREL software, but has the advantage that it is possible to estimate models with a dichotomous dependent variable more easily, using probit regression. This is also possible in LISREL, but only if one first calculates the latent scores. Calculating latent scores can only be done if none of the indicators has missing values. An alternative would be to use loglinear latent class analysis. The advantage of the latter method is that one can include categorical latent variables (with more than two categories). However, a disadvantage is the occurrence of parameter identification problems and local maxima. Especially complex models may cause severe problems.

Figure 7.1 Model without measurement error



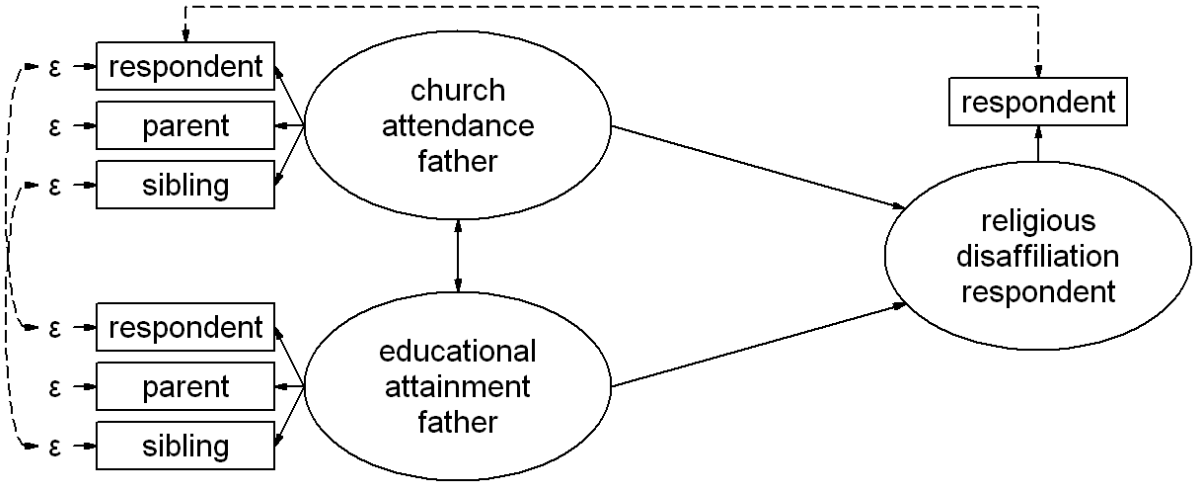
We estimate four structural equation models. Model 1 is a model without measurement error. This model is shown graphically in Figure 7. 1. Since measurement error is not included, all variables are observed variables based on the information provided by the primary respondent only.

Figure 7.2 Model with random measurement error



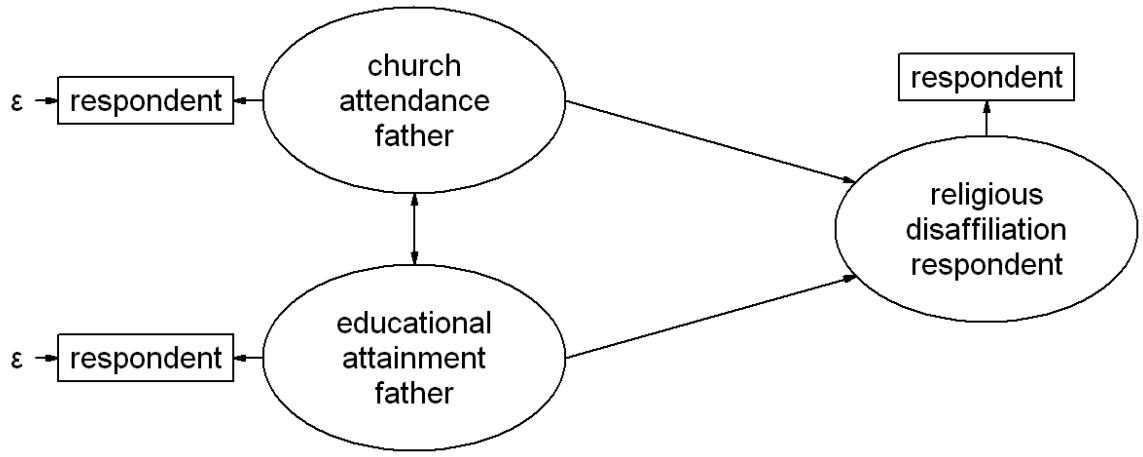
Model 2 (presented in Figure 7.2) is a model with random measurement error. In this model the two background characteristics are latent variables with three indicators each, the answer of the primary respondent, the answer of a parent and the answer of a sibling.

Figure 7.3 Model with correlated measurement error



Because errors may be correlated and because these correlations may affect the structural effects, we estimate a third model in which errors between respondent answers and sibling answers on the two background variables are allowed to correlate. Moreover, leaving church is allowed to influence the respondent's answer on father's church attendance when the respondent was 15 years old. This is displayed in Figure 7.3.

Figure 7.4 Model with imputed measurement error



Model 4 is based on information from primary respondents only, but the effects are adjusted for measurement error, based on the error sizes and error relations found in the Model 2 and Model 3. This model is displayed in Figure 7. 4.

7.3.2 Approach to missing values

As mentioned above, we do not have information from all parents and siblings. In Chapters 2, 4, 5 and 6 we used the multiple-group option to deal with missing data. With probit analysis in Mplus, this is complicated since one cannot restrict the residual variance in the dependent dichotomous variable in all five groups to be equal. Therefore, we use Full Information Maximum Likelihood (FIML) (Enders, 2001; Muthén and Muthén, 2001). FIML is similar to the multiple-group approach, but respondents are put into groups on the basis of the missing value patterns automatically. Moreover, instead of groups, individuals are analyzed. For this reason, one does not obtain covariance matrices for the separate groups with which the analyses are to be performed. Furthermore, FIML does not provide the usual fit statistics but a Chi-square test for the difference between the unrestricted model and the restricted (i.e., estimated) model. More information on coping with missing values can be found in Section 1.5.4.

7.4 Model 1: No measurement error

Model 1 in Table 7.2 contains the effect parameters for female, age, father's educational attainment and father's church attendance when the respondent was 15 years old on leaving church (see also Figure 7. 1). All information for this model is obtained from the primary respondent only and is considered to be measured without error. It is a probit analysis with listwise deletion of missing values.

The model is saturated since all relations between the independent variables are estimated freely, as in ordinary probit analysis. Therefore the Chi-square and the degrees of freedom are zero.

The effects we are interested in are the structural (regression) effects of the paternal characteristics on disaffiliation. It turns out that father's church attendance during socialization decreases the probability that his children leave church, while father's educational attainment increases the probability of disaffiliation. This is in line with previous research. Older people are more likely to be unchurched. Given previous findings on cohort and life-cycle effects, this is probably due to the fact that some of the younger people will become unchurched in the future[47]. Women have a lower probability of disaffiliating than men. This is also similar to some previous findings.

7.5 Model 2: Random measurement error

The effects of female, age, and father's educational attainment and father's church attendance in the past on becoming unchurched, taking random measurement error in father's educational attainment and church attendance into account, are presented in Model 2 of Table 7.2. Female and age are considered to be measured without error. Although the variable disaffiliation may contain measurement error, we do not include this error, since it is not possible to include error in the dependent variable in probit analysis. Neglecting random measurement error in the dependent variable is not as problematic as neglecting measurement error in an intermediary variable. In the latter case, the direct effect of the variable that is partly intermediated by the other variable is overestimated.

[47] We also performed the analysis with birth year and a dummy variable indicating age 25 or lower (to prevent multicollinearity). It turned out that neither of these variables had an effect on disaffiliation.

Table 7.2 Probit regression of religious disaffiliation on father's education, father's church attendance, female, and age

	Model 1 no measurement error			Model 2 random measurement error			Model 3 correlated measurement error			Model 4 imputed measurement error		
	b	s.e.	stan-dar-dized	b	s.e.	stan-dar-dized	b	s.e.	stan-dar-dized	b	s.e.	stan-dar-dized
Effects on disaffiliation												
Father's church attendance (1-4)	**-.192**	.023	-.213	**-.256**	.045	-.240	**-.242**	.061	-.223	**-.267**	.034	-.250
Father's educational attainment (6-18)	**.048**	.008	.150	**.070**	.012	.186	**.069**	.013	.185	**.065**	.011	.173
Female (male=0, female=1)	**-.166**	.054	-.080	**-.166**	.055	-.079	**-.165**	.055	-.079	**-.171**	.055	-.081
Age (18-54)	**.008**	.003	.069	**.011**	.003	.090	**.010**	.003	.088	**.011**	.003	.090
Chi-square	0			12.656			14.877			0		
df	0			15			15			0		
n	2337			2337			2337			2337		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).
Standardized effects refer to the effects of the explanatory variables after they are standardized.
Since we use WLSMV estimation (in combination with FIML), the Chi-square value cannot be used for a Chi-square difference test.

The model fit is good according to the Chi-square statistics. Comparing Model 2 with Model 1, it turns out that the effect of father's church attendance differs slightly; the standardized effect is 13 percent greater (-.240 instead of -.213). The effect of father's educational attainment is greater too (.186 instead of .150; i.e., 24 percent larger). However, these differences are not significant[48].

7.6 Model 3: Correlated error

As we argued in Chapter 1, correlated measurement errors can be of two kinds. First, respondents may bias answers about their father towards their own situation. Second, respondents may make several characteristics of their father more consistent with each other.

Table 7.3 Bias of reported father's church attendance and father's educational attainment toward characteristics of the respondent and the father

		Father's church attendance according to respondent			Father's educational attainment according to respondent		
Source	Variable	b	s.e.	beta	b	s.e.	beta
Parent	Father's church attendance (1-4)	**.799**	.037	.759			
Parent	Father's educational attainment (6-20)				**.761**	.021	.793
Respondent	Father's church attendance (1-4)				-.080	.064	-.028
Respondent	Father's educational attainment (6-20)	-.002	.013	-.004			
Religious disaffiliation respondent (0-1)		-.081	.089	-.033			
R square (adjusted)		.581			.631		
n		343			743		

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

Table 7.3 presents the results of two regression analyses in which the answers that the primary respondents have given about their father's educational attainment and church attendance are predicted by (i) the information the parents have provided about these issues, and (ii) the other characteristic of the father according to the respondent. With respect to father's church

[48] We computed the significance with the formula:
$Var(\beta_1-\beta_2) = Var(\beta_2) + Var(\beta_1) (X_2^T W X_2) Var(\beta_1) - 2[Var(\beta_1)]$ (Clogg, Petkova, and Haritou, 1995).

attendance, we also examine whether disaffiliation of the respondents has an effect on the error. If there is no systematic bias, the characteristic of the respondents and the other characteristic of the father will not have an effect on the information they have given about the specific characteristic of the father. According to Table 7.3, there is no evidence of correlated measurement error.

Although substantially correlated errors were not found, we re-estimated Model 2 allowing the errors to be correlated, as an additional test. We included the correlation between the error in the respondent's answers on father's educational attainment and father's church attendance and did the same for the sibling's answers.

Table 7.4 Correlation between errors in answers on different family background variables

	covariance	s.e.	correlation
Respondent information			
Father's church attendance and father's educ. attainment	.049	.111	.013
Sibling information			
Father's church attendance and father's educational attainment	.107	.103	.028

Note: Bold figures indicate that the effect is significant at the .05 level (one-sided test).

Model 3 in Table 7.2 presents the probit regression coefficients when correlated measurement error is taken into account. Again the model fits well. With probit analysis one cannot apply the Chi-square difference test or compare the BIC values. The effects do not differ substantially from those found for Model 2. Table 7.4 presents the error correlation between father's educational attainment and father's church attendance. This error correlation is not significant, neither for the respondent answers, nor for the sibling answers[49]. Since no error in leaving church is included, we could not allow the error in leaving church to be correlated with the error in respondent's answer on father's church attendance. Instead, we allowed the variable leaving church to have an effect on respondent's answer on father's church attendance. Note that this does not imply that leaving church influences father's church attendance, since leaving church does not influence the latent variable father's church attendance. Table 7.5 shows that respondent's answer on father's church attendance is not biased towards own disaffiliation. Since no correlated error is present, we conclude that Model 2 is the model to be preferred.

[49] This error correlation is significant for the parental answers ($p < .05$ for a one-sided test, correlation of -.054). In the other chapters, no significant error correlations in parental information were present (not shown). The error correlation between the parental information does not affect the structural effects.

Table 7.5 Effect of religious disaffiliation on reported father's church attendance

	slope	s.e.	standardized
Father's church attendance and respondent's disaffiliation	-.024	.054	-.021

7.7 Model 4: Imputed error

This section describes the sizes of the error in the information that respondents provide about their father. This information is important if one wants to correct the size of the effects of father's educational attainment and church attendance for measurement error in the case that one has information from one source only. The information is obtained from Model 2, since no correlated error is present.

Table 7.6 shows the effects of the latent variables on the indicators. The effects of the latent variables on the indicator that contains the information given by respondents is set to one, which is done to determine the measurement scale; the choice for the respondent indicator instead of the parent- or sibling indicator is arbitrary. The square of the standardized effects refers to the reliability. The respondent information seems to be somewhat less reliable than the parent/sibling information.

Table 7.6 The effects of latent paternal characteristics on their indicators

	Indicator respondent			Indicator parent			Indicator sibling		
	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized	slope (λ)	s.e.	stan-dar-dized
Father's church attendance	1.000	- -	.855	1.008	.169	.906	1.026	.158	.881
Father's educational attainment	1.000	- -	.866	1.083	.055	.887	1.046	.053	.895

Note: The effects of the latent variables on the respondent-indicators are set to one

The error variances of the indicators of the two latent variables (father's educational attainment and father's church attendance) in the model, as a proportion of the total variance of the indicators, are presented in Table 7.7. These proportions indicate how reliable the answers given by the different informants are. The error variance is about a quarter of the total variance, corresponding with a reliability of .75. By specifying the error variance of the two background variables, it is possible to adjust the structural effects in the case where only

respondent information is present (Hayduk, 1987). This has been done in Model 4. Model 4 is saturated just as Model 1.The effects are about the same as those in Model 2.

Table 7.7 The proportion of indicator error variance

	Indicator respondent	Indicator parent	Indicator sibling
Father's church attendance	.269	.178	.224
Father's educational attainment	.250	.213	.199

7.8 Conclusion and discussion

In this chapter we investigated the consequences of measurement error for the effects of father's educational attainment and father's church attendance in the past on religious disaffiliation. We showed that after correcting for measurement error, both the religious socialization dimension and the rationalization dimension of parental background still have a significant influence on religious disaffiliation. Correcting for measurement error does not lead to different conclusions.

Some previous research (discussed in Section 7.1) showed that having one non-religious parent also has an effect on becoming unchurched. We re-estimated the model including this variable. However, the effect of one parent being a non-member strongly depends on the selection of respondents. A small group of respondents (n = 77) had two non-religious parents (at age 15), but did say that they (ever) belonged to a religious denomination. The majority of these people had converted to a denomination or left church before they were 15. Another small group had at least one religious parent but did not belong to a denomination at age 12 (n = 124). If one parent was not a church member, this only had a significant and positive effect on disaffiliation if either of these groups was included in the analyses and one parent being a non-member was put together with two parents being a non-member at age 15. We also performed the analyses including these groups and including parental-non-membership as an explanatory variable. However, taking measurement error in these models into account made the effects in these models very unstable due to fact that the relation between parental non-membership and father's church attendance had become very strong. Hence it is difficult to distinguish between the effects of the two variables. Small changes in the model substantially changed the effects: either only father's church attendance had an effect, or only parental non-membership, or both, or neither of them. We did find some corroboration for respondent's answer on parental non-membership to be biased towards

respondent's own disaffiliation. The models we presented in this chapter are stable. Small changes do not change the conclusions substantially.

Te Grotenhuis and Scheepers (2001) found an effect of father's social class on religious disaffiliation, with especially the children of farmers having a lower probability of disaffiliating. Father's social class is difficult to incorporate since it is a categorical variable with more than two categories. We employed a loglinear model with measurement error using latent class analysis (Vermunt, 1997). It turned out that the children of farmers have a lower probability of leaving church, and the offspring of the higher middle class a higher probability. The effect of father's educational attainment is indirect via father's social class. Allowing for measurement error did not affect these conclusions, although the effect of father's class became somewhat stronger. Unfortunately, these models turned out to be unstable and unidentified. Creating a dummy variable indicating whether the father was a farmer caused computational problems as well.

Although usually characteristics of respondents are included in the models too, we only focused on family background characteristics, in order to prevent the models from becoming too complex. We did perform a probit analysis with person-periods as the unit of analysis. In this model we included respondent's own educational attainment. The effect of father's educational attainment stayed significant after holding constant son's/daughter's educational attainment, and the model did not alter the conclusions of this chapter, but the effects depended on how the linear dependence of age, period, and cohort (age = period (year) - cohort (birth year)) was dealt with. By excluding characteristics of respondents, we estimated the *total* effects of father's educational attainment and church attendance. And this was our main interest.

Chapter 8: Conclusion and discussion

8.1 Introduction

In this study we have investigated the consequences of measurement error in family background variables. The research questions are:
(i) To what extent do measurements of family background variables suffer from random and correlated measurement error?
(ii) To what extent are the effects of family background characteristics on individual life chances under- or overestimated by random and correlated measurement error?
(iii) To what extent is it possible to correct for under- or overestimation due to random and correlated measurement error?

We have investigated the consequences of measurement error empirically for different issues (the fields of social stratification, cultural consumption research, political sociology, and the sociology of religion) separately in Chapters 2 to 7. The reason is that the answer to our research question not only depends upon the size and the character of the measurement error in the family background variables, but also on their relations with other variables in the model. This implies that bias can be different for different family background factors and different dependent variables.

In all empirical chapters, the consequences of measurement error have been analyzed in the same way. We have used information from parents and siblings of the primary respondents on family background and have estimated four structural equation models. In Model 1, only information provided by primary respondents is used, which in standard research practice is assumed to be measured without error. Model 2 allows for random measurement error in family background characteristics and in characteristics of respondents themselves. Family background variables are treated as latent variables with the answers provided by the three informants as indicators. For the respondent characteristics, only respondent information is used, but random error is included by using an estimate of the size of the measurement error. In Model 3, correlated measurement is taken into account. Model 4 uses information from primary respondents only, but corrects for measurement error on the basis of the error estimates obtained from Models 2 and 3.

The aim of our study, specifically its scientific relevance, has three elements:
- assessing both random and correlated error;
- providing insight into the extent to which the magnitudes of family background effects change;
- making an adjustment of the size of effects for measurement error possible in future research.

We discuss these three elements in the sections below.

8.2 Random and correlated error

We have made progress by investigating biases in family background effects that result from both random and correlated measurement error. Random error variance is present in all background variables studied. Table 8.1 summarizes the proportions of random error variance in the answers of respondents on all family background variables. For the majority of variables in Table 8.1, the error variance is larger than .20, referring to a reliability below .80. However, reliability is not extremely low, but about .75. This is not much lower than our estimates of the reliability of respondent's information about themselves. Note that the proportion of error variance of a variable may differ across Model/Chapter. These differences are not only due to differences in the model specification, but also due to sample differences. This is especially apparent for father's church attendance when the respondent was 15 years old. In Chapter 6 on party preference, the proportion of error variance in father's church attendance is very low, namely .150, while in Chapter 7 on religious disaffiliation it is much higher, namely .269. This difference is due to the fact that in Chapter 7 only those who grew up religiously were investigated. This results in a lower variance and reliability is higher if the variance is higher (Miller, 1995). Moreover, for those who did not grow up religiously, the question on father's church attendance might be easier to answer, since their fathers are unlikely to have gone to church at all.

Table 8.1 The proportion of error variance in respondent information on family background

	proportion of error variance
Father's educational attainment	.213-.250
Father's occupational status	.242-.260
Parental material resources	.205
Parental cultural resources	.287-298
Father's church membership	.313
Father's church attendance	.150
Father's church attendance (only respondents who grew up religiously)	.269
Father's self-employment	.230
Father's party preference	.194

We did not find much proof for correlated measurement error. The significant error covariances for respondent information in the different chapters are presented in Table 8.2. In total, in our study we observed only seven cases of significant error covariance in the

retrospective information provided by respondents. Moreover, most of them are small, namely below .050 (standardized). The only correlation larger than .05 is the error correlation between parental cultural consumption and son's/daughter's cultural consumption. Our analysis shows that respondents bias their answers on parental cultural consumption toward their own cultural consumption. The size of this (standardized) correlation is, depending on the variables in the model, between .054 and .091.

Table 8.2 Covariances between errors in answers on different family background characteristics

Chapter		covariance	s.e.	correlation
4	Father's educational attainment with parental material resources	**1.224**	.476	.027
4	Female with parental material resources	**-1.253**	.604	-.048
5	Father's educational attainment with parental cultural consumption	**1.130**	.553	.023
5	Respondent's educational attainment with father's educational attainment	**.275**	.130	.025
5	Respondent's cultural consumption with parental cultural consumption	**21.391**	3.689	.091
6	Father's church membership with father's church attendance	**.013**	.007	.023
6	Respondent's church membership with father's church membership	**.008**	.003	.039

Note: Bold figures indicate that the covariance is significant ($p < .05$, one-sided test)

In summary then, random measurement accounts for about 25 percent of the total variance in family background variables. We have found little evidence for the presence of correlated measurement error.

8.3 The extent to which family background effects change

In many studies, the reliability of variables has been studied. Our contribution is that we have looked especially at the consequences of unreliability for estimated effects. We think that a study of the consequences is very important since many theories do not address measurement of variables or concepts as such, but relations between concepts, i.e., effects. The uncorrected

and the corrected structural effects are presented in Table 8.3. Sometimes the random measurement error model is presented and sometimes the correlated measurement errror is given, depending on which of the two has the best fit. We discuss the differences between uncorrected and corrected effects for the four fields investigated in this study: social stratification, cultural consumption, political sociology, and the sociology of religion. The results with respect to trends in the status attainment model (Chapter 3) are left out in this table, since in these trend analyses the errors of Chapter 2 were used.

With respect to social stratification, we have investigated status attainment, trends in status attainment, and the role of parental resources in educational attainment. Our analysis on status attainment shows that the positive effect of father's occupational status on son's/daughter's educational attainment, which has often been found using a conventional measurement of family background variables, turns out to be caused by measurement error. After correcting for measurement error, this effect is no longer significant, while the effect of father's educational attainment is 41 percent stronger than in the model without controls for measurement error. The effects of father's occupational status and son's/daughter's educational attainment on son's/daughter's occupational status are less biased by measurement error: the effect of father's occupational status is not influenced by measurement error, and the effect of son's/daughter's educational attainment is 21 percent greater after error correction.

Trends in the status attainment process were studied un Chapter 3. In this chapter we used the estimates of measurement error as found in Chapter 2. We conclude that the bias in family background effects in the status attainment model is mainly present for the oldest cohorts (not shown in Table 8.3) and that the trend toward more openness as found in conventional research seems to be slightly attenuated due to measurement error. It is important to note that the differences between the uncorrected and the corrected trends in the effects of family background and son's/daughter's educational attainment are not significant.

Cultural and material resources are included in the educational attainment model to give better insight into the educational attainment process. In conventional models, educational reproduction via cultural resources is attenuated by 50 percent due to measurement error, i.e., the indirect educational reproduction via cultural resources doubles if measurement error is taken into account. In addition, as in the status attainment model of Chapter 2, father's occupational status turns out to have no direct effect on son's/daughter's educational attainment, if measurement error is included in the model.

With regard to the intergenerational transmission of cultural consumption, we performed several analyses with different explanatory variables (father's educational attainment, father's occupational status, and son's/daughter's educational attainment were not included in all analyses). Whether the transmission of cultural consumption is under- or overestimated depends on which other variables are incorporated into the model. Still, in all models the effect of parental cultural consumption is strong and significant after correcting for measurement error. The effect of son's/daughter's educational attainment on their cultural

Table 8.3 Regression coefficients without and with correction for measurement error

Chapter		no measurement error		with measurement error		Δ beta	
		b	beta	b	beta	(%)	sig.
2	Effects on respondent's educational attainment						
2	Father's educational attainment (6-20)	**.300**	.311	**.444**	.440	41	**
2	Father's occupational status (10-90)	**.025**	.127	.010	.046	-64	*
2	Effects on respondent's occupational status						
2	Father's occupational status (10-90)	**.141**	.143	**.148**	.145	1	
4	Effects on parental material resources						
4	Father's educational attainment (6-20)	**.789**	.202	**.836**	.214	6	
4	Father's occupational status (10-90)	**.089**	.110	**.103**	.125	14	
4	Effects on parental cultural resources						
4	Father's educational attainment (6-20)	**1.867**	.433	**2.488**	.606	40	
4	Father's occupational status (10-90)	**.195**	.219	**.143**	.165	-54	
4	Effects on respondent's educational attainment						
4	Father's educational attainment (6-20)	**.202**	.209	**.202**	.201	-4	
4	Father's occupational status (10-90)	**.017**	.086	.004	.017	-80	*
4	Parental material resources (20.53–83.35)	**.015**	.060	**.022**	.087	45	
4	Parental cultural resources (31.74–98.10)	**.044**	.196	**.072**	.296	51	**
5	Effects on cultural consumption						
5	Father's educational attainment (6-20)	**.216**	.046	-.150	-.031		
5	Father's occupational status (10-88)	**.056**	.057	.022	.022	-61	
5	Parental cultural consumption	**.473**	.433	**.678**	.581	34	**
5	Effects on cultural consumption [50]						
5	Father's educational attainment (6-20)	**-.179**	-.038	**-.642**	-.135	255	*
5	Father's occupational status (10-88)	.020	.021	.006	.006	71	
5	Parental cultural consumption (28.15 - 95.64)	**.385**	.353	**.520**	.448	27	*
5	Effects on cultural consumption						
5	Parental cultural consumption (28.15 - 95.64)	**.375**	.343	**.348**	.299	-13	
6	Effects on respondent's party preference						
6	Father's church membership (0-1)	**-.188**	-.050	-.429	-.109	118	
6	Father's church attendance (1-4)	**-.176**	-.151	**-.285**	-.260	72	
6	Father self employed (0-1)	**.154**	.041	.062	.017	-59	
6	Father's party preference (1.67-8.17)	**.209**	.299	**.305**	.451	51	**
7	Effects on disaffiliation						
7	Father's church attendance (1-4)	**-.192**	-.213	**-.256**	-.240	13	
7	Father's educational attainment (6-18)	**.048**	.150	**.070**	.186	24	

* = p < .05, ** = p < .01

[50] In this model, the effect of respondent's educational attainment is also included.

consumption is attenuated, independent of whether father's educational attainment and father's occupational status have been included in the model.

Within the field of political sociology we focus on family background effects on party preference. The effects of father's party preference and son's/daughter's educational attainment on left-right voting are attenuated 34 percent due to measurement error. Furthermore, the positive effect of father's self-employment, which is found if the conventional measurement of family background characteristics is used, is caused by random measurement error.

Religious disaffiliation is the aspect of the sociology of religion we address. The effect of father's educational attainment is attenuated by 19 percent due to measurement error, while the effect of father's church attendance is hardly affected.

When we started this research project, we were unable to predict whether family background effects are under- or overestimated in models that do not control for measurement error. Now, we arrive at two main conclusions. First, Table 8.3 shows that, in general, effects are underestimated. On the few occasions in which effects are overestimated, such as the effect of father's occupational status on son's/daughter's educational attainment, other effects in the model are underestimated. The overestimation of effects is not due to correlated measurement error, but due to insufficient control for other variables (since those other variables are also measured with error). That effects are generally underestimated stems from the fact that correlated error is hardly present (see Section 8.2).

Second, theories on the consequences of 'economic' aspects turn out to be less supported in models with correction for measurement error than in models without correction for measurement error, while theories on the effects of 'cultural' aspects get more support if measurement error is included in the model. This leads to a stronger conclusion with respect to the ratio of the effects of 'economic' and 'cultural' aspects of family background. Cultural aspects are more important than economic aspects when measurement error is not incorporated into the model. After correcting for measurement error, the relative importance of cultural aspects (in proportion to economic aspects) for educational attainment, occupational status, cultural consumption, and party preference is even stronger. Father's occupational status, father's self-employment and parental material resources can be considered to resemble the economic aspect of family background. The direct effects of father's occupational status on son's/daughter's educational attainment and cultural consumption, and the direct effect of father's self-employment on party preference are non-significant after correcting for measurement error. Still, the effects of father's occupational status on son's/daughter's occupational status and of parental material resources on son's/daughter's educational attainment are significant after measurement error has been included.

Summing up, in general, family background effects are underestimated when measurement error is not taken into account. Sometimes, a family background effect is overestimated. However, this usually only happens in models in which another effect is

underestimated. Further, the influence of cultural aspects of family background is underestimated, while the influence of economic aspects of family background is overestimated.

8.4 Adjusting the size of effects for measurement error in future research

If the size of the measurement error is known, and if it is known to what degree the error is correlated, it is possible to adjust the estimated effects for measurement error, even if only information provided by one informant is at hand. We have shown that corrected effects on the basis of information provided only by the primary respondent are similar to effects on the basis of information from the three informants.

But is it necessary to correct for measurement error? Do we have to worry about the bias that is caused by measurement error? This depends partly upon whether one wants to test hypotheses about whether an effect is present or not, or whether one is interested in the size of effects. Some social scientists are interested only in the presence and direction of effects, not in the size of the effect. We find that some hypotheses about the presence of effects of economic aspects of family background are supported when conventional measurement of family background characteristics are used, while they in fact should be rejected. Still, the majority of the hypotheses corroborated with information provided by primary respondents are corroborated too when measurement error is taken into account.

It is also important to look at the size of effects. Some social scientists do not pay much attention to the size of effects, possibly because they acknowledge that the size of effects is strongly biased by measurement error, while it is less likely that an effect, which in reality is not present, is found to be present on the basis of survey data that contain measurement error. The sizes of effects are relevant for several reasons.

First, some theories not only state whether a variable has an effect, but also whether some variables have stronger effects than other variables. For example, one does not just want to know whether cultural resources have an effect on educational attainment and whether material resources have an effect on educational attainment, but also whether the effect of cultural resources is stronger than the effect of material resources. Since the bias of the two effects can differ, one should compare unbiased effects.

Second, some theories refer to whether effects are constant over time, and if not, how strong the trends in the effects are. For example, in the sociology of stratification, an important issue is to what extent the influence of family background on educational attainment and occupational status has declined over time.

Third, since sociology studies societies, it is important to know whether the size of effects differs over countries. Because the attenuation due to measurement error can differ between countries, it is important to compare corrected effects instead of uncorrected effects.

Fourth, the size of the effects affects the R square. A low R square in sociological research is usually considered to imply that the influence of social factors is small. However, in conventional research, the R square is usually underestimated.

We see more change regarding the size of family background effects than with regard to the presence or absence of effects. Although we have found that the error proportions in both the family background and respondent's characteristics are about .25, the attenuation of family background effects is not necessarily about 25 percent, as is the case for bivariate relations. We sometimes found an attenuation stronger than 25 percent, while we also found an overestimation of effects. Therefore, a reliability of .75 does not mean that one can neglect measurement error in a multivariate analysis. In order to find the true effects, one could specify the size of the measurement error, for instance by using the sizes of the error (co)variances found in this book.

If one corrects for the bias due to measurement error in family background variables, one should keep in mind that one does not only have to correct for error in the family background variables, but also for error in the variables referring to the current situation of the respondent. It is unlikely that these variables are measured error-free. Social scientists are often interested in the ratio of the influence of family background characteristics and the influence of own current characteristics. A fair comparison of the two implies correcting for measurement error in both.

In brief, it is possible to obtain the correct family background effects, also when one has information provided only by primary respondents. This can be done by specifying the size of the error variances.

8.5 Generalizability

8.5.1 Generalizability towards other countries

In this section we discuss the generalizability of our findings toward other countries and toward other models. The generalizability toward other countries may depend upon whether the salience of family background variables in other countries differs from their salience in the Netherlands. The more salient a characteristic in a certain country is, the more reliable its measurement is likely to be. In general we think that our results can be generalized toward other countries. Exceptions might be the reliability of party preference and the reliability of religiosity.

The salience of party preference probably depends on the degree of political polarization in a country. Many of our respondents grew up during the 1970s, a time in which politics in the Netherlands was very polarized. This might have made it easier for respondents to answer questions about father's party preference correctly. On the other hand, the Dutch

political system consists of a many different political parties. Moreover, parties merged or split up into different parties, which makes it more difficult to recollect father's party preference. However, reliability is only strongly affected if respondents mention a party that is far removed from the true party on the left-right scale.

The generalizability of the religiosity aspect of family background is not obvious either. Our reliability estimate of father's church membership is low compared to other family background variables. This may be due to a high proportion of passive church members. Since the proportion of passive church members differs over countries, the generalizability of church membership differs over countries too. We already noted (see Section 8.2) that the reliability of father's church attendance differs strongly between Chapter 6 (in which respondents were selected whose parents had a party preference and who had a party preference themselves) and Chapter 7 (in which respondents were selected at least one of whose parents was a church member).

In brief, the generalizability of our findings about the reliability of variables is not always self-evident. Unfortunately, for most family background variables, no information about their reliability is present for other countries. With respect to the status attainment model, the reliability of family background variables has been investigated in different countries. However, most studies have been conducted using the multiple moment approach (asking the same questions at different moments). In Section 1.5.1 we argued that the reliability that is established with the multiple moment design strongly depends on the time-lag between the two measurements. This makes it difficult to compare our results with those of previous research. Nevertheless, that we find no effect of father's occupational status on respondent's educational attainment, while other studies do, seems not to be due to a difference in the size or character of the measurement error, but to the fact that father's occupational status plays a more important role in the educational attainment process of other countries.

If one wants to investigate the effect of family background in a specific country, while no information for that country is present, one should not just assume that the error variance is zero, as is conventionally done, since the complete absence of error is highly unlikely to be the case. Instead, one should argue whether the reliability is higher or lower than in the Netherlands and try different values for the reliability to ascertain the sensitivity of the structural effects to measurement error.

8.5.2 Generalizability toward other models

To what extent are the results we found generalizable to other models (for the same sociological field and for other fields)? In this book we looked at the consequences of measurement error for different sociological models. For each field of sociology, we

investigated the family background variables that are most often used as explanatory variables. Nevertheless, it is always possible to come up with other models that include different variables. If other variables are included in a model, or if a different dependent variable is used, the problem is not just that the reliability of those other variables is unknown, but also that it is unknown whether measurement error in the new variables is related to error in the variables studied in this book. Moreover, the error (co)variances of the variables we investigated may change if variables are included in or excluded from the model. We have seen that this is the case with the models on cultural consumption, where the bias of respondent information on parental cultural consumption towards respondent's cultural consumption depends on the model used. Again, one may want to perform a sensitivity analysis to determine how strong conclusions depend upon the sizes of the error(co)variance.

8.6 Recommendations for future research

In this study we have investigated the consequences of measurement error in family background variables for four important sociological fields. It would be interesting to study the sociology of the family as well. In the sociology of the family, it has repeatedly been found that people whose parents are divorced have themselves a higher probability of divorcing. This effect could be biased by measurement error.

In addition, it is important to replicate the current research with a larger sample, i.e., more parents and siblings. This offers the possibility to investigate differences in reliability between subgroups, such as higher and lower educated, and old and young people. For example, in the United States, Bielby, Hauser, and Featherman (1977c) and Wolfle (1985, 1987) found differences between the reliability in the answers of blacks and whites.

In some countries, it is possible to combine respondent information with census information. This makes it possible to use registered data to investigate measurement error and its consequences. In the Netherlands, census information is not available and privacy regulations make combining survey information with census information difficult, even if census information is present.

Further, it is fruitful to use a combination of the multiple informant and the multiple moment design (see Section 1.5.1). Besides interviewing a parent and a sibling of the respondent, it is possible to interview the respondent for a second time. In Section 1.5.1 we stated that a disadvantage of the multiple moment design is that respondents may remember the answers they gave in the previous wave. With the combined design it is possible to find out how strong this remembrance effect is by investigating whether and how much stronger the correlation between the two respondent answers is than the correlation of a respondent answers with the answer of another informant. An additional advantage of the combined design is that it becomes easier to investigate the reliability of the answers of people older

than 55. Although the group of persons older than 55 with a living parent is increasing, this group is very small, which makes the investigation of the reliability of their answers using the multiple informant design difficult. Still, one should bear in mind that the use of survey information collected during the respondent's youth is unfeasible, since that implies that one only has a selective group of people for whom one has retrospective data and about the current situation, while in conventional research, one has retrospective data of a random group. This makes it difficult to compare the effects corrected for measurement error with the effects found in conventional research.

Next, it is important to study what the consequences of measurement error in information on own characteristics in the past are. Various researchers have investigated the quality of life history data, such as the occupational career (Becker, 2001; De Graaf, Wegener, and Liebig, n.d.) unemployment situations (Dex and McCulloch, 1998; Reimer, 2004), and past voting behavior (Himmelweit, Jaeger Biberian, and Stockdale, 1978; Van der Eijk and Niemöller, 1979). However, the consequences of error in these data are not well known. With life history data, the same problems can occur as with family background data. Random error is likely to be present. Further, error may be biased towards the current situation and different situations in the past may be made more consistent than is really the case. An extra kind of error is the wrong estimation of the timing of an effect. Errors in the timing can be random, but it is also possible that respondents have a tendency to estimate events systematically earlier or later than is really the case (backward and forward telescoping). It is acknowledged that panel data and retrospective data can lead to different conclusions (Rijken and Dronkers, 2001; Solga, 2001). However, these differences are not necessarily due to measurement error. Other causes for differences in the outcomes of retrospective data and panel data are the time period under investigation (panel data usually cover a shorter period than retrospective data) or the presence of attrition in panel data.

Finally, one has to investigate the consequences of error in current self-report data. In this study we took measurement error in current self-report data into account on the basis of the correlation of answers of primary respondents about themselves with the answers of parents about primary respondents. The reliability of current self-report data turns out to be only slightly higher than the reliability of retrospective other-report data. This makes it relevant to further investigate measurement error in current self-report data, although errors in these data are less likely to be correlated. One could interview parents, siblings, partners, or adult children. Another method would be to use multiple measurements. However, in this case, differences in answers could be the result of real changes. One of the most commonly used current-self-report variables is educational attainment. This makes it important to investigate whether information about this variable is biased towards other variables.

Strikingly, researchers stress the importance of replication, but it may be that they are replicating biased results endlessly. This research provides a tool to correct for measurement

error. One analysis with correction for measurement error contributes more to knowledge than two analyses without error correction.

In this section, we gave some suggestions for further research. These are not difficult to discern: there is ample room for improvement. Nevertheless, the fact that improvement of this research is possible is no excuse for neglecting the present results. This study has shown that the consequences of measurement error in family background variables are substantial.

Appendix I The questions about family background characteristics

Educational attainment

Wat is de hoogst voltooide opleiding van uw ouders? [*What is the highest completed education of your parents?*]
Vader/ Moeder [*Father/Mother*]: (1) lagere school, vglo [*primary school*], (2) lbo, huishoudschool, vbo [*lower vocational training*], (3) mavo, ulo, mulo [*lower general education*], (4) havo, mms [*intermediate general education*], (5) vwo, hbs, atheneum, gymnasium [*pre-universty education*], (6) kort mbo (kmbo) [*short intermediate vocational training*], (7) volledig mbo [*normal intermediate vocational training*], (8) hbo, kandidaatsexamen [*higher vocational training*], (9) universiteit [*university*], (10) postacademisch (bijv. notariaat, doctorstitel, artsexamen) [*post-university*]
[1992: (1) was split up in completed and uncompleted primary education, (6) and (7) were combined]

Occupational Status

Wat voor baan had uw vader **toen u 15 was**? [*What was your father's occupation **when you were 15 years old**?*]
- Welke functie had hij? ... [*What was his occupation?*]
- Waaruit bestonden zijn werkzaamheden? ... [*What were his tasks?*]
- Bij wat voor een soort bedrijf werkte uw vader (bijv. betonfabriek of advocatenkantoor)? ... [*For what kind of company did he work?*]

[the second question was not asked in 1992 and 1998-respondent]

Cultural resources

1992: Hieronder staan een aantal dingen opgesomd die sommige mensen graag doen in hun vrije tijd.
Graag willen we weten of uw vader en moeder deze dingen deden toen u opgroeide (d.w.z. 15 jaar oud was)? [*Below we mention activities that some people like to do in their spare time. We would like to know whether your father or mother did these activities when you grew up (i.e., were 15 years old)?*]
- Bezoeken van een museum met schilderijen of andere kunst [*visiting art museums*]
- Bezoeken van een museum met historische voorwerpen [*visiting historical museums*]

- Naar opera of ballet te gaan [*visiting opera or ballet*]
- Naar een klassiek concert gaan [*visiting classic music*]

Lezen [*Reading*]:
- Literaire poëzie [*literary poetry*]
- Nederlandse literatuur (zoals Reve, Hermans, etcetera) [*Dutch literature*]
- Vertaalde buitenlandse literatuur (zoals Böll, Marques, Steinbeck) [*translated literature*]
- Literatuur in een vreemde taal [*literature in a foreign language*]

(1) nooit [*never*], (2) tenminste 1x per jaar [*at least once a year*], (3) meerdere malen per jaar [*several times a year*]

1998: Las uw moeder/vader vroeger thuis wel eens boeken? [*Did your mother/father read books at home?*]
(1) ja [*yes*], (2) nee [*no*], (9) niet van toepassing (geen moeder/vader aanwezig) [*no parent present*]
Als uw moeder/vader boeken las, welk soort boeken las zij/hij dan? [*If your mother/father read books, what kind of books did she/he read?*]
- Nederlandse literaire romans, vertaalde literaire romans [*Dutch literature, translated literature*]
- Literatuur in een vreemde taal [*literature in a foreign language*]

(1) nooit [*never*], (2) soms [*sometimes*], (3) vaak [*often*]

2000: Lazen uw ouders **toen u 15 jaar oud was** …? [*When you were 15 years old, did your parents read ...?*]
- Nederlandse literaire romans, vertaalde literaire romans [*Dutch literature, translated literature*]
- Literatuur in een vreemde taal [l*iterature in a foreign language*]

vader/moeder [*father/mother*]: (1) nooit [*never*], (2) soms [*sometimes*], (3) vaak [*often*]

1998/2000: We noemen u nu een aantal uitgaansactiviteiten. Kunt u aangeven hoe vaak uw ouders (een van hen of beiden) aan deze activiteiten deelnamen **toen u ongeveer 15 was**? [*Could you please specify in which of the following activities your parents (one of them or both) participated when you were about 15 years old?*]
- Bezoeken van moderne of oude gebouwen (architectuur) [*visiting old or modern buildings (architecture)*]
- Bezoeken klassieke concerten, opera en ballet [*visiting classic music, opera, and ballet*]
- Bezoeken historische musea (bijv. openlucht-museum, spoorwegmuseum) [*visiting historical museums*]
- Bezoeken kunstmusea (beeldende kunst) [*visiting art museums*]
- Bezoeken serieus theater (drama, dans) [*visiting classical theatre*]

(1) nooit [*never*], (2) 1, 2 of 3 keer per jaar [*1, 2, or 3 times a year*], (3) 4, 5 of 6 keer per jaar [*4, 5, or 6 times a year*], (4) vaker dan 6 keer per jaar [*more than 6 times a year*]

Material resources

1992: Hoeveel woon- en slaapkamers waren er in dat huis? (Tel keuken, badkamer, open zolders, hal en gang niet mee.) [*How many living- and bedrooms were in that house?*]
Hoeveel personen woonden er in het huis toen u 15 jaar oud was? [*How many people lived in the house when you were 15 years old?*]
Had u een eigen slaapkamer, of moest u met iemand delen? [*Did you have your own bedroom, or did you have to share with someone?*]
(1) gedeelde slaapkamer [*shared bedroom*], (2) eigen slaapkamer [*own bedroom*]
Waren de slaapkamers in het ouderlijk huis verwarmd? [*Were the bedrooms in the house you grew up in heated?*]
(1) geen verwarmde slaapkamers [*no heated bedrooms*], (2) sommige slaapkamers verwarmd [*some bedrooms heated*], (3) alle slaapkamers verwarmd [*all bedrooms heated*]
En waren er in uw ouderlijk huis, toen u 15 jaar oud was, de volgende dingen [*Which of the following items were present in the house you grew up in when you were 15 years old*]:
- Garage [g*arage*]
- Telefoon [*telephone*]
- Auto [*car*]
- Koelkast [*refrigerator*]
- Fototoestel [*camera*]
- Televisie [*television*]
- Diaprojector [*dia projector*]
- Open haard [*open fire*]
- Centrale verwarming [*central heating*]

(1) nee [*no*], (2) ja [*yes*]

1998: Was het een huurhuis of een eigen woning? [*Was the house rented or owned?*]
(1) huurhuis [*rented house*], (2) eigen woning [*own house*]
Hoeveel woon- en slaapkamers waren er in dat huis? (Tel hierbij *niet* mee: keuken, badkamer, open zolder, hal of gang) [*How many living- and bedrooms were in that house?*]
Hoeveel personen woonden er in het huis toen u 15 jaar oud was (uzelf niet meegerekend)? [*How many people lived in the house when you were 15 years old (excluding yourself)?*]
Waren de slaapkamers in het ouderlijk huis verwarmd? [*Were the bedrooms in the house you grew up in heated?*]
(1) nee, er waren geen verwarmde slaapkamers [*no heated bedrooms*], (2) sommige

slaapkamers waren verwarmd [*some bedrooms heated*], (3) alle slaapkamers waren verwarmd [*all bedrooms heated*]
We noemen nu een aantal goederen. Kunt u voor elk van deze aangeven of ze bij u thuis in bezit waren toen u ongeveer 15 jaar oud was? [*Could you please tell which of the following goods were present in the house you grew up in when you were 15 years old?*]
- Auto [*car*]
- Video- of filmcamera [*videocamera*]
- Diepvriezer (niet in koelkast) [*freezer*]
- Afwasmachine [*automatic dishwasher*]
- Videorecorder [*video-recorder*]
(1) nee [*no*], (2) ja [*yes*]

2000: We noemen u nu een aantal goederen. Kunt u voor elk van deze aangeven of ze bij u thuis in bezit waren **toen u ongeveer 15 jaar oud was**? [*Could you please tell which of the following goods were present in the hous eyou grew up in when you were 15 years old?*]
- Auto [*car*]
- Garage [g*arage*]
- Video- of filmcamera [*videocamera*]
- Diepvriezer (niet in koelkast) [*freezer*]
- Afwasmachine [*automatic dishwasher*]
- Videorecorder [*video-recorder*]
- Centrale verwarming (cv) [*central heating*]
(1) nee [*no*], (2) ja [*yes*]

Self employment

Werkte uw vader **toen** als zelfstandige, of was uw vader in loondienst bij het bedrijfsleven of bij de overheid? [*Was your father self employed, a salaried employee in the commercial sector, or a salaried employee in the government sector?*]
(1) loondienst bedrijfsleven [*salaried employee in the commercial sector*], (2) loondienst (semi-) overheid [*a salaried employee in the government sector*], (3) eigen rekening/zelfstandig [*self employed*], (4) meewerkend gezinslid [*working family member*]
[1992 parents: '*no occupation*' instead of '*working family member*']

Church membership

respondent and 1992-sibling: Waren uw vader en moeder lid van een kerk of geloofsgenootschap toen u opgroeide (ca. 15 jaar oud was)? Zo ja, welk? [*Did your father or mother belong to a church or religious denomination when you were about 15 years old? If yes, which?*]
vader/moeder [*father/mother*]: (1) Niet lid van een kerk of geloofsgenootschap [*not a member of a church or religious denomination*], (2) Rooms Katholiek [*Roman Catholic*], (3) Nederlands Hervormd [*Dutch Reformed*], (4) Gereformeerd [*Reformed*], (5) Ander christelijk genootschap: ... [*Other christian church:...*], (6) Niet-christelijk genootschap:... [*non-christian denomination:...*]
[1998/2000: (5) Islam, (6) anders, nl ... [*other, namely...*]]
[1998: (9) niet van toepassing (ouder niet aanwezig) [*no parent present*]]

1992 parent: Beschouwde U zichzelf als lid van een kerk of geloofsgenootschap toen Uw kind opgroeide? En hoe was dat voor Uw partner in die tijd? [*Did you consider yourself to be a member of a church or religious denomination when your child was growing up? And what about your partner in that period?*]
ikzelf/partner [*myself/partner*]: (1) Geen lid kerk of geloofsgenootschap [*not a member of a church or religious denomination*], (2) Wel lid kerk of geloofsgenootschap [*yes, member of a church or religious denomination*]
Zo ja, welke kerk of welke geloofsgenootschap was dat? [*If yes, which church or religious denomination]*
ikzelf/partner [*myself/partner*]: (0) Geen lid kerk of geloofsgenootschap [*no member of a church or religious denomination*], (1) Rooms Katholiek [*Roman Catholic*], (2) Nederlands Hervormd [*Dutch Reformed*], (3) Gereformeerd [*Reformed*], (4) Ander christelijk genootschap: ... [*Other christian church:...*], (5) Niet-christelijk genootschap:... [*non-christian denomination:...*]

1998/2000 parent: Beschouwt u zichzelf als behorend tot een kerk of geloofsgemeenschap? [*Do you consider yourself to be a member of a church or religious denomination*]
(1) ja [*yes*], (2) nee [*no*]
Heeft u ooit tot een kerk of geloofsgemeenschap behoord? Denk daarbij ook aan uw jeugd of de tijd dat u nog bij uw ouders woonde. [*Have you ever belonged to a church or religious denomination? Think about the time when you were still living with your parents too*]
(1) ja [*yes*], (2) nee [*no*]
Hoe oud was u op het moment dat u zich niet meer rekende tot een kerk of geloofsgemeenschap?
[*How old were you when you no longer considered yourself to be a member of a church or*

religious denomination?]
Welke kerk of geloofsgemeenschap betreft of betrof dit? [*Which church or religious denomination was or is this?*]
(1) Rooms Katholiek [*Roman Catholic*], (2) Nederlands Hervormd [*Dutch Reformed*], (3) Gereformeerd [*Reformed*], (4) Ander christelijk geloof, namelijk: ... [*Other christian church:...*], (5) ander niet-christelijk geloof, namelijk: ... [*other non-christian denomination, namely:...*]
[2000: (4) Islam, (5) anders, nl ... [*other, namely...*]]

2000 sibling: Behoort uw vader tot een kerk of geloofsgenootschap? [*Does your father belong to a church or religious denomination?*]
(1) ja [*yes*], (2) nee [*no*], (3) niet van toepassing: overleden [*deceased*]
Heeft uw vader ooit tot een kerk of geloofsgenootschap behoord? Denk daarbij ook aan zijn jeugd. [*Has your father ever belonged to a church or religious denomination?Think about his youth too*]
(1) ja [*yes*], (2) nee [*no*]
Hoe oud was uw vader toen hij zich niet meer rekende tot een kerk of geloofsgemeenschap? [*How old was your father when he no longer considered himself to be a member of a church or religious denomination?*]
Welke kerk of geloofsgemeenschap betreft of betrof dit? [*Which church or religious denomination was or is this?*]
(1) Rooms Katholiek [*Roman Catholic*], (2) Nederlands Hervormd [*Dutch Reformed*], (3) Gereformeerd [*Reformed*], (4) Islam, (5) anders, nl ... [*other, namely...*]]

Church attendance

Hoe vaak bezochten uw ouders diensten of vieringen van een kerk of geloofsgenootschap **toen u 15 jaar oud was**? [*How often did your parents attend religious services of a church or denomination?*]
Vader/Moeder [*Father/Mother*]: (1) (vrijwel) nooit [*(almost) never*], (2) een of enkele keren per jaar [*once or several times a year*], (3) ongeveer 1 keer per maand [*about once a month*], (4) ongeveer 1 keer per week [*about once a week*], (5) vaker dan 1 keer per week [*more than once a week*]
[in 1992 the last category is not offered as an option]

Party preference

1992: Weet u naar welke politieke partij de voorkeur van uw vader en moeder uitging, toen u 15 jaar oud was? [*Do you know which political party your father and mother preferred when you were 15 years old?*]
vader/moeder [*father/mother*]: (1) Groen Links, (2) CPN, (3) PSP, (4) PPR, (5) PvdA, (6) SDAP, (7) D66, (8) CDA, (9) CHU, (10) ARP, (11) KVP, (12) RK Staatspartij, (13) VVD, (14) SGP, (15) GPV, (16) RPF, (17) Andere partij, n.l.: ... [*Other party, namely ...*], (98) Weet niet [*Don't know*], (99) Ging niet stemmen [*Did not vote*]
[parent/sibling: DS70 is added]

1998/2000: Naar welke partij ging de voorkeur van uw ouders uit **toen u ongeveer 15 was**? [*Which party did your parents prefer when you were 15 years old?*]
vader/ moeder [*father/mother*]: (1) PvdA of SDAP, (2) CDA of KVP, CHU, ARP, (3) VVD, (4) D66, (5) GroenLinks of PPR, (6) PSP, (7) CPN, (8) SGP, (9) GPV, (10) RPF, (11) andere partij, nl.: ... [*Other party, namely ...*], (98) weet *echt* niet [*Really don't know*], (99) niet van toepassing (ouder niet aanwezig) [*no parents present*]
[2000 parent/sibling: GroenLinks en PPR are separate categories]

Appendix II The covariance matrices used

(R) = information obtained from respondent
(P) = information obtained from parent
(S) = information obtained from sibling

Appendix Chapter 2

Covariance matrix total sample (n=3138)	1.	2.	3.	4.	5.	6.
1. Birth year (R)	70.697					
2. Female (R)	0.046	0.250				
3. Educational attainment father, respondent aged 15 (R)	4.658	-0.005	11.272			
4. Occupational status father, respondent aged 15 (R)		9.246	0.205	32.539	265.027	
5. Educational attainment respondent (R)	3.790	-0.129	4.345	16.610	10.429	
6. Occupational status respondent (R)	2.712	-0.768	15.737	77.115	27.991	256.544

Chapter 2: Covariance matrix Group A (n=226)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	53.502									
2.	-0.510	0.250								
3.	5.365	-0.071	10.967							
4.	4.793	-0.055	9.498	12.692						
5.	5.129	-0.015	9.037	10.176	11.708					
6.	13.199	-0.245	34.425	38.656	34.506	280.087				
7.	6.584	0.137	37.769	37.927	35.257	229.659	302.802			
8.	6.431	0.140	37.624	38.316	37.044	229.764	258.762	299.256		
9.	3.907	-0.221	3.580	4.743	3.896	18.477	14.808	15.187	10.392	
10.	2.000	-0.364	17.138	21.862	18.658	100.080	105.507	90.827	24.920	236.311
Means	19.027	0.465	9.819	9.442	9.814	46.354	46.783	47.500	12.159	51.000

1 = birth year, 2 = female, 3 = educational attainment father (R), 4 = educational attainment father (P), 5 = educational attainment father (S), 6 = occupational status father, respondent aged 15 (R), 7 = occupational status father, respondent aged 15 (P), 8 = occupational status father, respondent aged 15 (S), 9 = educational attainment respondent (R), 10 = occupational status respondent (R)

Chapter 2: Covariance matrix Group B (n =161)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	78.089									
2.	0.660	0.251								
3.	6.765	0.035	13.007							
4.	10.684	0.079	10.515	14.084						
5.	0.000	0.000	0.000	0.000	1.000					
6.	12.846	1.138	38.174	37.393	0.000	294.847				
7.	34.049	0.526	43.797	45.399	0.000	248.329	333.408			
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
9.	2.523	-0.135	4.579	5.053	0.000	20.454	24.738	0.000	11.609	
10.	5.409	-0.385	17.955	19.217	0.000	98.160	112.941	0.000	30.378	279.381
Means	21.068	0.484	10.416	9.876	0.000	48.242	48.292	0.000	12.571	53.137

Chapter 2: Covariance matrix Group C (n=336)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	76.768									
2.	0.258	0.251								
3.	3.749	0.016	12.041							
4.	0.000	0.000	0.000	1.000						
5.	5.340	0.109	9.266	0.000	10.940					
6.	14.381	0.788	35.110	0.000	35.460	295.017				
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
8.	10.363	0.977	35.915	0.000	36.903	231.396	0.000	294.849		
9.	5.148	-0.050	5.265	0.000	4.482	23.350	0.000	20.559	10.997	
10.	12.420	-0.863	19.614	0.000	18.415	94.522	0.000	91.556	29.784	277.680
Means	16.411	0.503	9.146	0.000	9.080	45.185	0.000	45.685	11.655	49.438

Chapter 2: Covariance matrix Group E (n =464)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	46.807									
2.	0.204	0.250								
3.	2.365	-0.104	11.164							
4.	3.236	-0.086	9.240	11.777						
5.	0.000	0.000	0.000	0.000	1.000					
6.	3.978	0.276	31.011	34.994	0.000	251.693				
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
9.	0.543	-0.118	3.134	3.727	0.000	14.293	0.000	0.000	8.921	
10.	-10.033	-0.971	9.807	10.448	0.000	53.032	0.000	0.000	23.583	240.923
Means	24.116	0.511	10.131	9.903	0.000	46.246	0.000	0.000	12.328	51.205

Chapter 2: Covariance matrix Group D (n =1951)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	69.219									
2.	-0.021	0.250								
3.	3.699	0.022	10.647							
4.	0.000	0.000	0.000	1.000						
5.	0.000	0.000	0.000	0.000	1.000					
6.	6.356	0.075	30.821	0.000	0.000	256.741				
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
9.	3.268	-0.130	4.159	0.000	0.000	14.546	0.000	0.000	10.255	
10.	1.206	-0.774	15.226	0.000	0.000	73.293	0.000	0.000	28.095	255.460
Means	18.657	0.505	8.935	0.000	0.000	43.862	0.000	0.000	11.249	49.043

Appendix Chapter 3

	Respondent's current occupation and education						Respondent's occupation and education at age 25						
Covariance matrix Cohort 1	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	14.044					(n=108)	14.242						(n=101)
2.	-0.170	0.242					-0.155	0.239					
3.	1.130	0.240	8.096				0.707	0.148	6.725				
4.	3.806	1.304	27.872	246.666			1.648	0.824	20.971	215.507			
5.	-1.505	-0.176	4.204	19.125	12.477		-1.128	-0.098	3.572	15.741	7.000		
6.	0.084	-0.574	14.476	111.693	33.435	280.825	-5.058	-0.128	13.292	96.441	22.830	216.980	

1 = age (R), 2 = female (R), 3 = educational attainment father (R), 4 = occupational status father, respondent aged 15 (R), 5 = educational attainment respondent (R), 6 = occupational status respondent (R)

Covariance matrix Cohort 2	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	14.842					(n=348)	14.816						(n=318)
2.	-0.150	0.244					-0.174	0.245					
3.	0.042	0.131	9.288				0.296	0.163	8.801				
4.	5.806	1.176	27.831	284.562			6.439	1.191	26.416	280.242			
5.	-0.300	-0.286	4.190	18.580	12.097		-0.517	-0.082	3.305	16.346	8.560		
6.	3.248	-1.339	13.891	102.946	34.853	269.789	0.599	0.230	14.571	104.366	22.345	210.362	

Covariance matrix Cohort 3	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	18.384					(n= 467)	18.130						(n=429)
2.	-0.068	0.249					-0.066	0.250					
3.	-0.379	-0.070	8.890				-0.242	0.012	7.417				
4.	3.218	-0.141	23.181	224.785			3.450	0.123	18.391	212.426			
5.	-0.202	-0.414	5.170	18.877	12.176		0.290	-0.206	3.507	13.827	8.463		
6.	-0.666	-1.816	19.167	91.037	34.018	272.722	-3.179	-0.492	16.016	84.318	25.760	248.824	

Covariance matrix Cohort 4	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	17.509					(n=570)	17.431						(n=535)
2.	-0.097	0.249					-0.108	0.250					
3.	-1.472	0.015	9.310				-1.563	0.057	8.673				
4.	-1.894	0.011	23.720	251.875			-2.166	0.228	22.801	248.054			
5.	-1.320	-0.219	3.892	17.860	11.183		-0.978	-0.016	2.197	12.170	7.272		
6.	3.760	-1.267	15.255	83.776	29.979	270.426	-3.872	0.271	12.705	72.261	20.949	214.255	

	Respondent's current occupation and education						Respondent's occupation and education at age 25						
Covariance matrix Cohort 5	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	16.885					(n= 784)	17.018						(n=716)
2.	0.055	0.250					0.078	0.250					
3.	-0.232	-0.045	10.108				-0.387	0.029	8.898				
4.	-2.269	0.254	29.380	252.266			-1.394	0.594	25.992	237.699			
5.	-0.277	-0.318	5.110	20.045	11.950		0.041	-0.048	3.545	14.963	8.224		
6.	0.837	-1.085	18.362	82.903	32.254	259.335	1.913	0.263	12.861	62.280	20.566	210.901	
Covariance matrix Cohort 6	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	18.137					(n= 812)	18.134						(n=738)
2.	-0.027	0.250					-0.062	0.250					
3.	0.466	-0.005	10.543				0.347	0.094	9.253				
4.	1.683	0.506	31.578	264.211			1.747	0.897	27.529	251.819			
5.	0.459	-0.142	4.666	16.207	11.029		0.480	0.054	3.069	12.045	7.569		
6.	3.735	-1.052	15.451	79.375	30.060	263.959	6.385	0.340	13.171	63.729	19.922	205.587	
Covariance matrix Cohort 7	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	16.914					(n =930)	17.108						(n=804)
2.	-0.124	0.250					-0.131	0.250					
3.	-0.169	-0.007	11.439				0.145	0.108	9.699				
4.	-2.273	0.323	36.359	282.851			-1.454	0.710	29.496	256.865			
5.	-0.721	-0.139	4.512	19.656	10.827		-0.153	0.034	2.434	11.320	6.418		
6.	-2.715	-1.277	15.821	77.661	29.267	249.289	-2.077	0.182	9.541	60.313	17.891	222.380	
Covariance matrix Cohort 8	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	15.595					(n =973)	15.561						(n=851)
2.	-0.006	0.250					0.022	0.250					
3.	-0.203	0.034	10.190				-0.285	0.023	9.173				
4.	-3.445	0.186	29.426	239.543			-3.258	0.141	26.058	231.493			
5.	-0.328	-0.010	3.446	13.628	9.677		-0.473	0.077	2.185	9.985	6.134		
6.	-0.058	-0.256	12.704	67.679	25.283	246.301	-2.602	0.680	9.987	64.713	14.163	190.416	
Covariance matrix Cohort 9	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	11.756					(n=804)	11.931						(n=706)
2.	0.025	0.250					0.038	0.249					
3.	-0.048	0.013	9.907				-0.165	0.041	8.729				
4.	-2.156	-0.194	28.351	237.951			-2.259	-0.210	23.696	223.450			
5.	-0.085	-0.008	3.406	13.431	8.795		-0.133	0.091	2.203	7.651	6.169		
6.	-0.016	-0.119	12.835	67.009	23.300	248.257	-3.399	0.712	11.305	45.947	15.731	210.599	
Covariance matrix Cohort 10	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	5.823					(n=448)	5.956						(n=390)
2.	0.014	0.250					0.037	0.249					
3.	-0.616	-0.012	9.676				-0.532	-0.080	9.178				
4.	-2.259	0.651	30.852	256.044			-2.267	0.538	27.978	237.261			
5.	0.123	-0.031	3.287	15.627	8.370		-0.548	-0.012	2.673	10.697	5.860		
6.	2.148	0.002	13.873	69.276	28.522	263.687	-0.831	0.638	8.932	38.500	15.728	216.591	
Covariance matrix Cohort 11	1.	2.	3.	4.	5.	6.	1.	2.	3.	4.	5.	6.	
1.	1.294					(n =142)	1.355						(n=131)
2.	0.015	0.246					0.027	0.244					
3.	-0.288	-0.034	9.350				-0.292	-0.038	8.553				
4.	-1.183	-0.196	33.813	274.790			-1.277	-0.055	30.665	255.174			
5.	-0.111	0.173	1.597	12.162	7.979		-0.319	0.228	1.204	7.512	6.570		
6.	-0.182	0.781	14.235	100.073	21.584	240.289	-0.514	0.678	10.225	68.593	18.656	206.261	

Appendix Chapter 4

Covariance matrix total sample (n=3086)	1.	2.	3.	4.	5.	6.	7.
1. Birth year (R)	70.551						
2. Female (R)	0.031	0.250					
3. Educational attainment father (R)	4.891	-0.010	11.422				
4. Occupational status father respondent aged 15 (R)	11.229	0.193	33.331	267.102			
5. Parental material resources (R)	60.488	-0.295	15.845	58.643	173.767		
6. Parental cultural resources (R)	15.255	0.014	28.095	114.940	56.834	212.403	
7. Educational attainment respondent (R)	3.941	-0.140	4.431	17.306	10.471	18.038	10.636

Chapter 4: Covariance matrix Group A (n=203)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	49.971														
2.	-0.340	0.249													
3.	4.454	-0.094	10.792												
4.	4.463	-0.099	9.523	12.944											
5.	4.862	-0.045	9.187	10.235	11.949										
6.	14.422	-0.471	33.574	38.387	34.865	279.842									
7.	2.734	0.250	35.961	37.383	34.760	223.028	302.330								
8.	3.853	0.117	35.304	37.112	36.948	229.719	256.866	299.004							
9.	38.275	-0.414	17.707	17.673	17.502	87.060	80.505	81.142	138.766						
10.	45.043	-0.202	20.968	22.324	21.699	92.535	95.552	92.708	126.347	179.819					
11.	32.319	0.094	19.506	19.499	21.459	77.504	82.666	80.613	100.315	119.340	147.130				
12.	20.601	-0.131	32.190	34.481	34.589	136.673	138.527	142.340	74.219	91.280	81.586	265.320			
13.	22.713	-0.694	27.984	29.188	28.384	114.716	116.857	114.886	65.396	73.927	65.594	152.377	201.306		
14.	13.867	-0.233	24.211	26.562	26.740	96.216	105.068	118.330	49.892	63.555	47.913	164.280	137.294	201.350	
15.	3.916	-0.240	3.097	4.334	3.576	18.929	13.101	13.876	13.583	16.034	14.249	17.092	15.071	13.821	10.296
Means	19.138	0.453	9.901	9.478	9.892	46.350	47.202	48.025	55.398	54.541	54.295	54.224	53.991	50.529	12.429

1 = birth year (R), 2 = female (R), 3 = educational attainment father (R), 4 = educational attainment father (P), 5 = educational attainment father (S) 6 = occupational status father, respondent aged 15 (R), 7 = occupational status father, respondent aged 15 (P), 8 = occupational status father, respondent aged 15 (S), 9 = parental material resources, respondent aged 15 (R), 10 = parental material resources, respondent aged 15 (P), 11 = parental material resources, respondent aged 15 (S) 12 = parental cultural resources, respondent aged 15 (R), 13 = parental cultural resources, respondent aged 15 (P), 14 = parental cultural resources, respondent aged 15 (S), 15 = educational attainment respondent (R)

Chapter 4: Covariance matrix Group B (n=144)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	81.067														
2.	0.421	0.252													
3.	6.627	0.052	14.084												
4.	10.814	0.030	11.551	15.576											
5.	0.000	0.000	0.000	0.000	1.000										
6.	10.338	0.710	43.231	43.525	0.000	322.909									
7.	38.465	0.113	49.274	51.903	0.000	279.131	355.134								
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
9.	60.295	1.060	19.024	18.103	0.000	54.622	73.951	0.000	159.224						
10.	65.476	0.624	19.289	22.941	0.000	73.595	99.729	0.000	146.059	195.073					
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000				
12.	45.579	1.231	38.688	38.927	0.000	146.203	170.855	0.000	100.404	107.474	0.000	271.947			
13.	31.955	0.984	27.817	30.707	0.000	123.872	157.023	0.000	78.757	86.239	0.000	186.380	278.732		
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	
15.	1.787	-0.210	5.471	6.022	0.000	21.333	25.375	0.000	11.130	11.078	0.000	22.854	26.159	0.000	11.858
Means	21.097	0.486	10.736	10.181	0.000	49.764	49.111	0.000	55.359	54.409	0.000	56.490	56.120	0.000	12.458

Chapter 4: Covariance matrix Group C (n=337)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	73.266														
2.	0.099	0.251													
3.	4.628	0.051	12.473												
4.	0.000	0.000	0.000	1.000											
5.	5.740	0.124	9.680	0.000	11.300										
6.	12.888	0.950	36.699	0.000	36.989	300.470									
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000								
8.	10.253	1.188	39.626	0.000	38.815	242.973	0.000	302.867							
9.	57.489	0.476	16.831	0.000	18.236	94.671	0.000	89.614	181.859						
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
11.	42.274	0.999	17.701	0.000	19.458	77.231	0.000	100.818	121.743	0.000	174.701				
12.	21.275	0.298	27.663	0.000	26.964	119.251	0.000	126.354	66.540	0.000	59.620	213.587			
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
14.	13.520	0.146	23.716	0.000	25.146	102.180	0.000	106.517	46.342	0.000	58.388	127.447	0.000	177.554	
15.	4.824	-0.081	5.592	0.000	4.672	23.957	0.000	23.307	14.837	0.000	14.516	19.889	0.000	17.149	11.146
Means	17.409	0.513	9.196	0.000	9.205	45.837	0.000	46.160	48.705	0.000	48.735	50.458	0.000	48.029	11.682

Chapter 4: Covariance matrix Group D (n=484)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	48.478														
2.	0.147	0.250													
3.	3.030	-0.115	11.001												
4.	3.691	-0.073	9.019	11.468											
5.	0.000	0.000	0.000	0.000	1.000										
6.	5.862	0.489	30.348	33.950	0.000	246.451									
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000								
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
9.	43.981	-0.416	10.794	9.647	0.000	31.832	0.000	0.000	133.368						
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000				
12.	11.426	-0.154	28.201	28.666	0.000	105.494	0.000	0.000	39.409	0.000	0.000	214.625			
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	
15.	0.932	-0.105	2.981	3.385	0.000	14.196	0.000	0.000	2.867	0.000	0.000	12.938	0.000	0.000	8.914
Means	24.130	0.506	10.116	9.911	0.000	46.395	0.000	0.000	54.385	0.000	0.000	52.374	0.000	0.000	12.395

Chapter 4: Covariance matrix Group E (n=1918)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	70.071														
2.	0.000	0.250													
3.	3.903	0.014	10.753												
4.	0.000	0.000	0.000	1.000											
5.	0.000	0.000	0.000	0.000	1.000										
6.	9.268	0.030	31.546	0.000	0.000	257.785									
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000								
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
9.	60.298	-0.453	14.159	0.000	0.000	50.718	0.000	0.000	174.855						
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000				
12.	7.931	-0.040	25.034	0.000	0.000	106.742	0.000	0.000	44.762	0.000	0.000	193.465			
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	
15.	3.449	-0.139	4.236	0.000	0.000	15.381	0.000	0.000	9.035	0.000	0.000	16.995	0.000	0.000	10.534
Means	18.657	0.504	8.956	0.000	0.000	43.897	0.000	0.000	48.430	0.000	0.000	48.551	0.000	0.000	11.248

Appendix Chapter 5

Covariance matrix total sample (n=3347)	1.	2.	3.	4.	5.	6.	7.
1. Female (R)	0.250						
2. Birth year (R)	0.100	87.765					
3. Educational attainment father (R)	-0.020	6.517	11.588				
4. Occupational status father, respondent aged 15 (R)	0.126	16.737	33.531	268.248			
5. Parental cultural consumption, respondent aged 15 (R)	0.012	21.246	28.377	114.452	215.496		
6. Educational attainment respondent (R)	-0.114	3.158	4.192	16.514	17.251	10.313	
7. Cultural consumption respondent (R)	1.048	-18.906	15.352	70.855	106.796	25.038	256.805

Chapter 5: Covariance matrix Group A (n=225)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	0.251												
2.	-0.151	61.726											
3.	-0.106	6.171	11.271										
4.	-0.092	6.368	9.943	13.204									
5.	-0.041	6.790	9.468	10.457	11.946								
6.	-0.168	22.161	35.761	39.462	36.054	285.246							
7.	0.342	9.576	37.739	38.111	35.614	232.104	303.984						
8.	0.249	12.369	37.778	39.028	38.479	238.882	261.994	304.704					
9.	-0.259	23.764	31.485	33.759	33.862	127.503	128.304	135.423	258.887				
10.	-0.546	31.253	29.556	30.870	29.945	119.260	118.729	122.350	150.398	213.400			
11.	-0.144	21.150	24.058	26.671	26.753	92.842	98.726	114.637	163.978	141.605	203.103		
12.	-0.233	5.128	3.584	4.620	3.815	20.127	15.030	15.234	18.061	15.341	15.299	10.413	
13.	0.179	0.615	16.402	19.537	18.362	95.437	63.165	66.649	131.636	90.853	72.032	28.285	292.876
Means	0.476	19.747	9.969	9.604	9.982	46.791	47.369	48.329	53.814	53.926	50.419	12.413	52.727

1 = female (R), 2 = birth year (R), 3 = educational attainment father (R), 4 = educational attainment father (P), 5 = educational attainment father (S), 6 = occupational status father, respondent aged 15 (R), 7 = occupational status father, respondent aged 15 (P), 8 = occupational status father, respondent aged 15 (S), 9 = parental cultural consumption, respondent aged 15 (R), 10 = parental cultural consumption, respondent aged 15 (P), 11 = parental cultural consumption, respondent aged 15 (S), 12 = educational attainment respondent (R), 13 = cultural consumption respondent (R)

Chapter 5: Covariance matrix Group B (n =174)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	0.251												
2.	0.499	94.325											
3.	0.032	5.190	13.960										
4.	0.014	10.715	11.312	14.814									
5.	0.000	0.000	0.000	0.000	1.000								
6.	0.835	13.848	41.664	42.075	0.000	306.003							
7.	0.119	39.659	47.977	50.399	0.000	266.845	341.590						
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
9.	0.851	43.322	37.619	38.169	0.000	140.887	169.105	0.000	270.874				
10.	0.634	37.695	24.958	28.732	0.000	105.791	137.021	0.000	179.194	271.579			
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
12.	-0.075	1.269	4.957	5.327	0.000	19.873	23.136	0.000	22.205	19.823	0.000	11.708	
13.	1.656	-11.061	16.645	19.227	0.000	87.724	103.808	0.000	136.846	146.482	0.000	28.326	282.435
Means	0.483	23.270	10.661	10.305	0.000	49.793	49.339	0.000	56.507	56.276	0.000	12.500	52.704

Chapter 5: Covariance matrix Group C (n=365)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	0.251												
2.	0.091	96.826											
3.	-0.021	6.259	12.318										
4.	0.000	0.000	0.000	1.000									
5.	0.018	7.908	9.479	0.000	11.376								
6.	0.472	20.400	35.780	0.000	36.447	294.163							
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
8.	0.745	15.522	38.104	0.000	37.488	232.782	0.000	298.819					
9.	0.046	20.621	26.384	0.000	25.720	112.449	0.000	119.509	207.236				
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
11.	-0.116	18.379	23.822	0.000	26.076	102.953	0.000	107.454	123.913	0.000	177.891		
12.	-0.087	3.136	5.145	0.000	4.197	22.786	0.000	21.445	18.917	0.000	15.272	10.843	
13.	1.253	-28.159	15.725	0.000	13.289	84.297	0.000	99.312	104.112	0.000	79.085	27.128	298.820
Means	0.512	18.389	9.216	0.000	9.222	45.734	0.000	46.090	50.001	0.000	47.590	11.608	51.359

Chapter 5: Covariance matrix Group D (n =569)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	0.250												
2.	0.238	65.029											
3.	-0.115	3.630	11.069										
4.	-0.079	4.626	9.066	11.547									
5.	0.000	0.000	0.000	0.000	1.000								
6.	0.250	10.708	29.754	33.310	0.000	250.863							
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
9.	0.016	18.489	28.200	29.072	0.000	106.580	0.000	0.000	222.199				
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
12.	-0.051	-1.741	2.528	2.999	0.000	12.098	0.000	0.000	11.284	0.000	0.000	8.474	
13.	0.847	-15.823	11.405	13.693	0.000	56.430	0.000	0.000	89.750	0.000	0.000	19.542	209.190
Means	0.513	26.279	10.258	10.065	0.000	46.856	0.000	0.000	52.669	0.000	0.000	12.239	49.940

Chapter 5: Covariance matrix Group E (n =2014)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	0.250												
2.	0.053	83.505											
3.	0.015	5.540	10.957										
4.	0.000	0.000	0.000	1.000									
6.	0.000	0.000	0.000	0.000	1.000								
6.	0.014	13.151	31.984	0.000	0.000	259.908							
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000					
9.	-0.012	13.017	25.552	0.000	0.000	107.367	0.000	0.000	195.944				
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000			
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000		
12.	-0.123	2.986	4.071	0.000	0.000	14.795	0.000	0.000	16.216	0.000	0.000	10.233	
13.	1.130	-21.205	15.608	0.000	0.000	66.233	0.000	0.000	103.407	0.000	0.000	24.961	254.847
Means	0.509	19.637	9.063	0.000	0.000	44.185	0.000	0.000	48.357	0.000	0.000	11.235	49.438

Appendix Chapter 6

Chapter 6: Covariance matrix total sample (n=2304)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. female (R)	0.250											
2. age (R)	-0.147	73.123										
3. church membership father, respondent aged 15 (R)	0.003	0.367	0.180									
4. church attendance father, respondent aged 15 (R)	0.002	2.224	0.385	1.882								
5. father self-employed, respondent aged 15 (R)	0.000	0.375	0.019	0.093	0.181							
6. party preference father, respondent aged 15 (R)	0.005	1.692	0.365	1.554	0.262	5.235						
7. educational attainment respondent (R)	-0.125	-3.044	-0.017	0.141	0.022	0.995	10.228					
8. church membership respondent (R)	0.016	0.371	0.094	0.323	0.032	0.349	-0.142	0.248				
9. church attaendance respondent (R)	0.045	0.487	0.145	0.628	0.053	0.716	-0.157	0.328	1.000			
10. occupational status respondent (R)	-0.771	6.072	-0.191	0.071	-0.012	4.114	26.499	-0.623	-1.003	246.421		
11. respondent self-employed (R)	-0.007	0.173	0.001	0.008	0.014	0.020	0.025	0.002	0.002	0.155	0.075	
12. party preference respondent (R)	-0.052	0.149	0.048	0.189	0.089	1.043	-0.458	0.186	0.359	0.167	0.035	2.570

Chapter 6: Covariance matrix Group A (n=158)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	0.247																			
2.	0.172	50.939																		
3.	-0.014	0.016	0.134																	
4.	-0.005	0.217	0.095	0.138																
5.	0.003	-0.089	0.080	0.098	0.121															
6.	-0.043	1.264	0.296	0.309	0.258	1.560														
7.	0.003	1.010	0.295	0.321	0.262	1.359	1.526													
8.	-0.061	0.688	0.291	0.310	0.267	1.356	1.412	1.730												
9.	-0.004	0.290	0.003	-0.002	0.011	0.062	0.071	0.096	0.193											
10.	-0.002	0.484	0.006	-0.005	0.002	0.068	0.066	0.089	0.154	0.184										
11.	-0.013	0.248	0.010	0.006	0.012	0.082	0.089	0.115	0.166	0.165	0.196									
12.	-0.113	1.314	0.236	0.229	0.240	1.217	1.361	1.560	0.209	0.159	0.188	4.362								
13.	-0.112	1.069	0.284	0.278	0.251	1.188	1.344	1.371	0.179	0.131	0.155	3.161	3.827							
14.	-0.062	1.021	0.223	0.277	0.256	1.217	1.441	1.506	0.226	0.208	0.238	3.618	3.254	4.280						
15.	-0.225	-4.134	-0.135	-0.088	-0.042	-0.234	-0.258	-0.099	-0.068	0.010	-0.045	0.576	0.860	0.934	10.361					
16.	0.019	0.529	0.080	0.058	0.057	0.252	0.266	0.257	0.043	0.040	0.052	0.346	0.306	0.310	-0.312	0.250				
17.	0.090	1.287	0.128	0.128	0.104	0.565	0.606	0.652	0.084	0.088	0.116	0.687	0.700	0.671	-0.540	0.347	1.141			
18.	0.007	7.045	-0.663	-0.852	-0.362	-1.753	-2.090	-1.928	-0.977	-0.730	-1.004	1.518	2.151	2.591	22.484	-0.796	-0.781	234.533		
19.	-0.007	0.194	0.002	-0.003	0.006	0.022	0.026	0.007	0.035	0.019	0.022	0.010	0.006	0.033	-0.280	0.004	0.023	-1.018	0.116	
20.	0.007	1.593	0.071	0.051	0.033	0.226	0.257	0.236	0.031	0.062	0.037	0.844	0.743	0.583	-0.682	0.274	0.445	-0.364	0.065	2.704
Means	1.430	36.500	0.842	0.835	0.861	2.981	3.095	2.949	0.259	0.241	0.266	6.461	6.697	6.518	12.430	0.544	1.924	51.278	0.133	5.409

1 = female (R), 2 = age (R), 3 = church membership father, respondent aged 15 (R), 4 = church membership father, respondent aged 15 (P), 5 = church membership father, respondent aged 15 (S), 6 = church attendance father, respondent aged 15 (R), 7 = church attendance father, respondent aged 15 (P), 8 = church attendance father, respondent aged 15 (S), 9 = father self-employed, respondent aged 15 (R), 10 = father self-employed, respodnet aged 15 (P), 11 = father self-employed, respondent aged 15 (S), 12 = party preference father, respondent aged 15 (R), 13 = party preference father, respondent aged 15 (P), 14 = party preference father, respondent aged 15 (S), 15 = educational attainment respondent (R), 16 = church membership respondent (R), 17 = church attendance respondent (R), 18. occupational status respondent (R), 19. respondent self-employed (R), 20. party preference respondent (R)

Chapter 6: Covariance matrix Group B (n =127)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	0.250																			
2.	-0.434	62.767																		
3.	-0.028	0.549	0.205																	
4.	-0.011	0.973	0.129	0.231																
5.	0.000	0.000	0.000	0.000	1.000															
6.	-0.039	2.476	0.388	0.427	0.000	1.837														
7.	0.008	2.684	0.420	0.490	0.000	1.638	1.868													
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000												
9.	-0.016	0.568	-0.006	0.006	0.000	0.062	0.039	0.000	0.144											
10.	-0.007	0.567	0.002	0.002	0.000	0.045	0.035	0.000	0.098	0.105										
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000									
12.	0.003	2.725	0.327	0.325	0.000	1.322	1.366	0.000	0.166	0.116	0.000	4.971								
13.	0.049	1.503	0.270	0.345	0.000	0.959	1.108	0.000	0.201	0.155	0.000	3.410	4.837							
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
15.	-0.094	-0.301	-0.045	0.134	0.000	0.453	0.395	0.000	-0.084	0.003	0.000	0.585	0.448	0.000	11.658					
16.	0.024	0.585	0.109	0.102	0.000	0.305	0.297	0.000	0.014	0.008	0.000	0.318	0.283	0.000	0.002	0.251				
17.	0.046	0.973	0.143	0.183	0.000	0.726	0.602	0.000	0.070	0.042	0.000	0.723	0.539	0.000	0.298	0.341	1.014			
18.	-0.396	10.490	-0.338	-0.467	0.000	-0.034	0.019	0.000	-1.004	-0.540	0.000	1.091	0.164	0.000	26.636	0.174	-0.526	231.355		
19.	-0.018	0.419	-0.004	-0.011	0.000	0.017	0.006	0.000	0.026	0.025	0.000	-0.026	0.054	0.000	0.083	-0.003	-0.028	-0.431	0.111	
20.	0.057	-1.335	0.009	-0.055	0.000	-0.050	-0.045	0.000	0.187	0.115	0.000	0.821	1.138	0.000	-0.187	0.168	0.448	-2.124	0.011	2.715
Means	1.457	35.701	0.717	0.646	0.000	2.551	2.638	0.000	0.173	0.118	0.000	6.210	6.284	0.000	12.843	0.465	1.780	54.205	0.126	5.177

Chapter 6: Covariance matrix Group C (n =203)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	0.251																			
2.	-0.191	67.013																		
3.	-0.004	0.219	0.181																	
4.	0.000	0.000	0.000	1.000																
5.	0.011	0.120	0.139	0.000	0.176															
6.	0.047	1.821	0.411	0.000	0.388	1.863														
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000													
8.	0.031	1.506	0.382	0.000	0.394	1.586	0.000	1.889												
9.	-0.001	-0.022	0.029	0.000	0.016	0.091	0.000	0.101	0.187											
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000										
11.	-0.003	-0.034	0.015	0.000	0.013	0.092	0.000	0.082	0.146	0.000	0.189									
12.	-0.037	2.276	0.401	0.000	0.362	1.717	0.000	1.766	0.187	0.000	0.172	5.071								
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
14.	0.046	1.034	0.399	0.000	0.380	1.618	0.000	1.693	0.206	0.000	0.212	4.095	0.000	4.766						
15.	0.006	0.691	-0.046	0.000	-0.072	0.169	0.000	0.225	-0.050	0.000	0.013	1.290	0.000	0.776	10.269					
16.	-0.001	-0.018	0.102	0.000	0.102	0.365	0.000	0.394	0.027	0.000	0.034	0.375	0.000	0.363	-0.070	0.251				
17.	0.031	0.457	0.159	0.000	0.151	0.640	0.000	0.686	0.056	0.000	0.072	0.808	0.000	0.818	-0.206	0.330	0.998			
18.	-0.280	5.478	-0.618	0.000	-0.539	-1.329	0.000	-1.346	-0.051	0.000	-0.113	3.910	0.000	1.580	28.529	-1.815	-1.484	255.516		
19.	-0.008	0.442	0.013	0.000	0.007	0.050	0.000	0.037	0.035	0.000	0.044	0.061	0.000	0.095	0.092	0.001	0.022	0.287	0.105	
20.	-0.083	-0.154	0.176	0.000	0.196	0.494	0.000	0.706	0.146	0.000	0.154	1.544	0.000	1.456	-1.026	0.285	0.616	-0.883	0.051	2.962
Means	1.483	40.527	0.764	0.000	0.773	2.833	0.000	2.773	0.246	0.000	0.251	6.205	0.000	6.319	12.182	0.493	1.773	51.547	0.118	5.158

Chapter 6: Covariance matrix Group D (n =386)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	0.250																			
2.	-0.281	52.731																		
3.	0.011	0.358	0.165																	
4.	0.001	0.226	0.135	0.201																
5.	0.000	0.000	0.000	0.000	1.000															
6.	0.032	1.728	0.353	0.443	0.000	1.870														
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000													
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000												
9.	-0.002	0.435	0.006	0.017	0.000	0.074	0.000	0.000	0.155											
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000										
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000									
12.	0.019	1.186	0.310	0.445	0.000	1.573	0.000	0.000	0.225	0.000	0.000	4.947								
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
15.	-0.110	0.665	-0.008	-0.086	0.000	-0.182	0.000	0.000	0.053	0.000	0.000	0.433	0.000	0.000	9.448					
16.	0.025	0.145	0.077	0.098	0.000	0.330	0.000	0.000	0.020	0.000	0.000	0.300	0.000	0.000	-0.129	0.246				
17.	0.067	-0.127	0.143	0.184	0.000	0.681	0.000	0.000	0.013	0.000	0.000	0.663	0.000	0.000	-0.401	0.353	1.055			
18.	-1.041	17.757	0.222	0.116	0.000	0.088	0.000	0.000	0.572	0.000	0.000	2.436	0.000	0.000	25.739	0.100	-0.742	237.241		
19.	-0.005	0.171	0.001	-0.003	0.000	-0.015	0.000	0.000	0.005	0.000	0.000	-0.007	0.000	0.000	0.055	-0.004	-0.001	0.171	0.042	
20.	-0.077	-0.739	0.006	0.014	0.000	0.100	0.000	0.000	0.019	0.000	0.000	0.859	0.000	0.000	-0.262	0.139	0.403	0.766	0.033	2.443
Means	1.526	34.710	0.793	0.723	0.000	2.762	0.000	0.000	0.192	0.000	0.000	6.207	0.000	0.000	12.588	0.435	1.839	51.782	0.044	5.209

Chapter 6: Covariance matrix Group E (n =1430)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	0.250																			
2.	-0.094	72.221																		
3.	0.007	0.479	0.186																	
4.	0.000	0.000	0.000	1.000																
5.	0.000	0.000	0.000	0.000	1.000															
6.	-0.003	2.632	0.396	0.000	0.000	1.919														
7.	0.000	0.000	0.000	0.000	0.000	0.000	1.000													
8.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000												
9.	0.004	0.312	0.025	0.000	0.000	0.104	0.000	0.000	0.189											
10.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000										
11.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000									
12.	0.022	2.192	0.389	0.000	0.000	1.571	0.000	0.000	0.301	0.000	0.000	5.432								
13.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000							
14.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000						
15.	-0.140	-2.957	-0.009	0.000	0.000	0.213	0.000	0.000	0.059	0.000	0.000	1.095	0.000	0.000	9.998					
16.	0.015	0.458	0.097	0.000	0.000	0.322	0.000	0.000	0.035	0.000	0.000	0.358	0.000	0.000	-0.154	0.248				
17.	0.037	0.649	0.145	0.000	0.000	0.608	0.000	0.000	0.059	0.000	0.000	0.713	0.000	0.000	-0.100	0.317	0.969			
18.	-0.886	4.708	-0.174	0.000	0.000	0.492	0.000	0.000	0.059	0.000	0.000	5.057	0.000	0.000	26.463	-0.705	-1.082	249.941		
19.	-0.005	0.097	0.000	0.000	0.000	0.005	0.000	0.000	0.011	0.000	0.000	0.023	0.000	0.000	0.033	0.004	0.000	0.303	0.071	
20.	-0.056	0.259	0.041	0.000	0.000	0.186	0.000	0.000	0.096	0.000	0.000	1.072	0.000	0.000	-0.397	0.176	0.294	0.475	0.031	2.520
Means	1.487	41.000	0.752	0.000	0.000	2.679	0.000	0.000	0.252	0.000	0.000	5.965	0.000	0.000	11.620	0.452	1.778	50.887	0.077	5.329

Samenvatting

(Summary in Dutch)

Inleiding

Binnen de sociale wetenschappen speelt de invloed van ouders op hun kinderen een belangrijke rol. Zo wordt bij statusverwervingsonderzoek (Blau en Duncan, 1967) gekeken naar de invloed van de opleiding en het beroep van (meestal) de vader en soms de moeder op het opleidingsniveau en de beroepsstatus van hun volwassen kinderen. Ter verklaring van opleiding wordt bovendien vaak gekeken naar de culturele en materële hulpbronnen van de ouders (De Graaf, 1986). Mensen van wie de ouders veel aan cultuur deden, doen zelf ook meer aan cultuur (Ganzeboom, 1984). De partijvoorkeur van ouders blijkt van grote invloed te zijn op de partijvoorkeur van hun volwassen kinderen (Need, 1997). Kerkverlating blijkt eerder op te treden, als de ouders minder religieus waren (Need en De Graaf, 1996).

Kenmerken van ouders toen de respondenten zelf ongeveer 15 jaar oud waren, worden meestal gemeten, door de respondenten op volwassen leeftijd daarover te ondervragen. Een panel, waarbij eerst de ouders over zichzelf worden ondervraagd wanneer de respondenten 15 zijn en jaren later de respondenten over zichzelf worden ondervraagd, is praktisch onuitvoerbaar. Ten eerste kost het veel tijd. Als men de invloed van ouders op vijftigjarige respondenten wil onderzoeken, dient men 35 jaar te wachten. Bovendien heeft men dan alleen nog maar informatie over mensen die een bepaald jaar geboren zijn. Ten tweede is het moeilijk om de adressen van de volwassen respondenten te achterhalen, waardoor de paneluitval waarschijnlijk groot is. Om deze redenen wordt er meestal voor gekozen om een steekproef uit de volwassen bevolking over hun ouders en over zichzelf te ondervragen. Een probleem bij deze methode is dat het voor respondenten moelijk kan zijn om de vragen over hun ouders correct te beantwoorden. Ten eerste worden mensen ondervraagd over iemand anders dan zijzelf. Ten tweede worden ze ondervraagd over een situatie in het verleden. Meetfouten in antwoorden over de ouderlijke achtergrond, kunnen de effecten van ouderlijke achtergrond op kenmerken van de respondenten op verschillende manieren vertekenen.

In het eenvoudigste geval is er één verklarende variabele en is de meetfout random. Random ('willekeurige') meetfout houdt in dat de meetfout niet samenhangt met kenmerken van de respondenten of hun ouders. Het gaat hierbij om toevallige vergissingen. Random meetfout in een verklarende variabele leidt tot een onderschatting van het effect van die variabele.

Als er meerdere verklarende variabelen zijn in een model, dan kan random meetfout ook tot een overschatting van een effect leiden. Dit kan bijvoorbeeld gebeuren wanneer een controlevariabele meetfout bevat, waardoor onvoldoende voor die controlevariabele gecontroleerd wordt.

Meetfout hoeft niet alleen random te zijn, maar kan ook gecorreleerd zijn met kenmerken van respondenten of hun ouders. Ten eerste is het mogelijk dat respondenten de neiging hebben om hun ouders meer op henzelf te laten lijken dan in werkelijkheid het geval is. Dit is het geval wanneer ze, bedoeld of onbedoeld, de sociale afstand tot hun ouders willen verkleinen. In dit geval wordt de invloed van gezinsachtergrond overschat. Ten tweede is het mogelijk dat respondenten het ene ouderlijke kenmerk proberen af te leiden uit het andere kenmerk. Als respondenten niet weten wat de opleiding van hun vader was, zouden ze uit het feit dat hun vader een goede baan had (ten onrechte) de conclusie kunnen trekken dat hun vader een hoge opleiding heeft voltooid. Zulke meetfout leidt er toe dat de relatie tussen vaders opleiding en vaders beroepsstatus wordt overschat. Dit kan ook van invloed zijn op de effecten van vaders opleiding en beroep op kenmerken van de respondent.

Uit het bovenstaande blijkt dat meetfouten tot vertekeningen in verschillende richtingen kunnen leiden. Vooraf valt niet te voorspellen welke vertekening optreedt. Daarvoor is empirisch onderzoek nodig. In dit onderzoek worden drie vragen beantwoord:
- in welke mate is er random en gecorreleerde meetfout in metingen van gezinsachtergrond?
- in welke mate worden de efecten van gezinsachtergrond op individuele kenmerken onder- of overschat door random en gecorreleerde meetfout?
- in welke mate is het mogelijk om voor de onder- of overschatting die het gevolg is van random en gecorreleerde meetfouten te corrigeren?

Deze vragen kunnen op zich met verschillende onderzoeksdesigns beantwoord worden. Ten eerste is het mogelijk om dezelfde respondenten verschillende keren te ondervragen (in een panel) en hen elke keer dezelfde vragen over hun ouders te stellen. Een nadeel is dat respondenten dan mogelijk dezelfde fout steeds opnieuw maken of dat ze zich nog kunnen herinneren welk antwoord ze de vorige hebben gegeven. Dit effect treedt vooral op wanneer de tijd tussen twee golven kort is. Wanneer er lange tijd tussen twee golven zit is de kans groot dat respondenten door verhuizingen tijdens de tweede golf niet meer te traceren zijn.

Ten tweede zou van (door bijvoorbeeld de overheid) geregistreerde gegevens gebruik kunnen worden gemaakt. Een probleem hierbij is dat lang niet alle informatie geregistreerd is (denk bijvoorbeeld aan politieke voorkeur). Bovendien gelden er strenge privacy regels voor het gebruik van deze data.

Voor dit onderzoek wordt gebruik gemaakt van een derde mogelijkheid: verschillende familieleden over de gezinsachtergrond ondervragen. In de voor dit onderzoek gebruikte Familie-enquêtes Nederlandse Bevolking 1992, 1998 en 2000 (Ultee en Ganzeboom, 1992; De Graaf, De Graaf, Kraaykamp en Ultee, 1998, 2000), zijn eerst respondenten over hun ouders ondervraagd en kregen vervolgens een broer of zus en de ouders een schriftelijke vragenlijst over de gezinsachtergrond. Een probleem hierbij is dat we niet van iedere respondent informatie van de ouders of een broer of zus hebben, bijvoorbeeld omdat de

ouders overleden zijn. Bovendien is het mogelijk dat de primaire respondent, de ouder en de broer/zus hetzelfde verkeerde antwoorden geven. In tegenstelling tot bij het hervragen van dezelfde respondent hebben we echter informatie uit verschillende bronnen en is het minder waarschijnlijk dat de ouder of de broer/zus de neiging hebben om de ouders meer op de primaire respondent te laten lijken dan in werkelijkheid het geval is.

Om de onderzoeksvragen te beantwoorden wordt gebruik gemaakt van Structural Equations Models (SEM), ook wel LISREL modellen genoemd. Elk model wordt vier keer geschat. Het eerste model is een model waarin alleen informatie die door primaire respondenten is gegeven wordt gebruikt. Hierbij wordt geen rekening gehouden met meetfouten. Dit model komt overeen met hoe analyses gewoonlijk worden uitgevoerd.

In het tweede model worden de gezinsachtergrond variabelen beschouwd als latente variabelen die elk door drie indicatoren worden gemeten, namelijk het antwoord van de primaire respondent, een ouder en een broer of zus. Elk van deze indicatoren wordt verondersteld meetfouten te bevatten. Ook de informatie die respondenten over zichzelf geven wordt verondersteld meetfouten te bevatten. In één van de drie enquêtes die gebruikt worden zijn ouders en broers/zussen over de primaire respondenten ondervraagd. Op basis van de correlaties tussen die antwoorden wordt de grootte van de meetfout berekend. Deze is in de modellen opgenomen. Het tweede model geeft de effecten van gezinsachtergrond wanneer rekening wordt gehouden met random meetfout.

Het derde model houdt niet alleen rekening met random meetfouten maar ook met gecorreleerde meetfouten. Het gaat hierbij zowel om meetfout-correlatie tussen twee kenmerken van gezinsachtergrond als om correlatie van meetfout in een kenmerk van respondenten met meetfout in hetzelfde kenmerk van de vader of ouders.

In het vierde model wordt net als in het eerste model alleen gebruik gemaakt van informatie die door de primaire respondenten is gegeven. Nu wordt echter de informatie over de grootte van de random en (indien aanwezig) de gecorreleerde meetfout uit het tweede en derde model gebruikt om de effecten van gezinsachtergrond te corrigeren voor de gevolgen van meetfouten.

De gevolgen van meetfouten in gezinsachtergrond wordt voor vier verschillende sociologische terreinen onderzocht, namelijk sociale stratificatie, culturele consumptie, politieke partijvoorkeur en kerkverlating.

Sociale stratificatie

Vaders beroepsstatus en opleidingsniveau hebben een positief effect hebben op iemands eigen opleidingsniveau, wanneer geen rekening wordt gehouden met meetfouten. Het effect van vaders opleiding is net als in eerder Nederlands onderzoek veel sterker dan het effect van vaders beroep. Wanneer de informatie van alle drie de bronnen gebruikt wordt en rekening

wordt gehouden met random meetfout wordt het effect van vaders opleiding veel sterker, terwijl het effect van vaders beroep verdwijnt. Er blijkt geen sprake te zijn van gecorreleerde meetfouten: respondenten hebben noch de neiging om de opleiding van hun vader meer op hun eigen opleiding te laten lijken noch de neiging om vaders opleiding en vaders beroep meer met elkaar te laten samenhangen dan in werkelijkheid het geval is.

Vaders beroepsstatus en de eigen opleiding blijken, overeenkomstig eerder onderzoek, een positief effect op de beroepsstatus te hebben. Wanneer rekening wordt gehouden met meetfouten dan wordt het effect van opleiding sterker, terwijl het effect van vaders beroepsstatus hetzelfde blijft. Gecorreleerde meetfout speelt wederom geen rol. Wanneer de analyses worden uitgevoerd op basis van enkel informatie van de primaire respondent, maar gecorrigeerd op basis van de gevonden random meetfout worden dezelfde effecten verkregen als wanneer de informatie van alle drie de informanten wordt gebruikt.

De Nederlandse samenleving is gedurende de twintigste eeuw opener geworden. De invloed van gezinsachtergrond op maatschappelijk succes is afgenomen. Het effect van vaders opleiding op de opleiding van de volwassen kinderen en het effect van vaders beroepsstatus op die van de zonen en dochters nemen inderdaad af in een model waarin geen rekening wordt gehouden met meetfouten. Na correctie voor meetfouten wordt de afname iets groter, maar het verschil met het model zonder correctie is niet significant.

Ter verklaring van de positieve effecten van vaders opleiding en beroepsstatus op de opleiding van de volwassen kinderen, wordt vaak naar de culturele en materiële hulpbronnen van de ouders gekeken. Mensen uit de hogere sociale lagen onderscheiden zich van degenen uit de lagere sociale lagen door een culturele leefstijl. Hierdoor raken ook hun kinderen meer vertrouwd met cultuur. Aangezien cultuur op school een belangrijke rol speelt, is het vertrouwd zijn met cultuur bevorderlijk voor iemands schoolcarrière. Daarnaast is ook het feit dat mensen uit de hogere sociale lagen over meer materiële hulpbronnen beschikken, gunstig voor de schoolloopbaan van hun kinderen. Als geen rekening wordt gehouden met meetfouten, blijkt inderdaad dat ouders over meer culturele hulpbronnen beschikken, naarmate de vader een hogere opleiding en beroepsstatus heeft. Zowel de hoeveelheid culturele als de hoeveelheid materiële hulpbronnen hebben een positief effect op het behaalde opleidingsniveau van hun zonen en dochters, maar het effect van culturele hulpbronnen is drie keer zo groot als dat van materiële hulpbronnen. Culturele en materiële hulpbronnen verklaren echter niet volledig het effect van vaders beroep op opleiding: ook nadat gecontroleerd wordt voor hulprbonnen hebben zowel vaders beroep als vaders opleiding een positief effect op de opleiding van de kinderen. Wanneer rekening wordt gehouden met meetfouten, neemt zowel het effect van vaders opleiding op de culturele hulpbronnen als het effect van culturele hulpbronnen op de opleiding van de kinderen toe. Hierdoor is de intergenerationele reproductie van opleiding via culturele hulpbronnen verdubbeld. Het directe effect van vaders beroepsstatus op de opleiding van de kinderen blijkt het gevolg van meetfout te zijn. Verder maken respondenten vaders opleiding en de ouderlijke materiële hulpbronnen meer consistent

dan ze in werkelijkheid zijn. Mannen rapporteren bovendien hogere materiële hulpbronnen dan vrouwen, hoewel er in werkelijkheid natuurlijk geen verschil is tussen mannen en vrouwen in de hoeveelheid materiële hulpbronnen van hun ouders.

Culturele consumptie

Gezinsachtergrond speelt een belangrijke rol bij de verklaring van culturele consumptie. De belangrijkste gezinsachtergrond variabele hierbij is de culturele consumptie van de ouders. Dit effect wordt voor een deel verklaard door opleiding: mensen wier ouders veel aan cultuur doen, zijn hoger opgeleid en hoger opgeleiden doen meer aan cultuur dan lager opgeleiden. Maar ook wanneer gecontroleerd wordt voor opleiding, heeft de culturele consumptie van ouders een sterk effect op de culturele consumptie van hun volwassen kinderen. Het effect van opleiding is echter sterker. Rekening houden met random meetfout leidt tot sterkere effecten van zowel de culturele consumptie van de ouders als van opleiding. Er is echter niet alleen sprake van random, maar ook van gecorreleerde meetfout: mensen laten de culturele consumptie van hun ouders meer op hun eigen culturele consumptie en op de opleiding van hun vader lijken dan in werkelijkheid het geval is. Wanneer hiermee rekening wordt gehouden wordt het effect van de culturele consumptie van de ouders weer iets kleiner. Het hangt af van welke variabelen er verder in het model zitten of het effect van de ouderlijke culturele consumptie groter is in een model waarin voor zowel random als gecorreleerde meetfout gecorrigeerd wordt dan in een model waarin helemaal niet voor meetfout gecorrigeerd wordt. In een model zonder de eigen opleiding, is het effect van de ouderlijke culturele consumptie groter, maar in een model met de eigen opleiding, maar zonder vaders beroepsstatus en opleiding is het effect ongeveer even groot.

Politieke partij voorkeur

Voor iemands partijvoorkeur is zowel iemands economische positie als iemands religiositeit van belang. Mensen met een hoge beroepsstatus en zelfstandigen hebben een rechtsere partijvoorkeur. Hetzelfde geldt voor kerkleden en mensen die veel naar de kerkgaan (dit effect blijft bestaan als rekening wordt gehouden met het feit dat mensen die veel naar de kerk gaan meestal lid zijn van een kerkgenootschap). Hoger opgeleiden hebben juist een linksere voorkeur, wanneer tenminste gecontroleerd wordt voor het feit dat hoger opgeleiden een betere economische positie hebben. Het grootste effect is echter het effect van vaders partijvoorkeur (uiteraard geldt dit ook voor moeders partijvoorkeur, maar omdat de partijvoorkeur van beide ouders sterk samenhangt, kunnen ze moeilijk beiden in één model worden opgenomen). Wanneer rekening wordt gehouden met meetfouten wordt het effect van

vaders partijvoorkeur nog sterker. Ook het effect van de eigen opleiding neemt toe, maar dit effect blijft minder sterk dan het effect van vaders partijvoorkeur. Gecorreleerde meetfout blijkt geen rol van belang te spelen.

Kerverlating

Gedurende de twintigste eeuw is Nederland sterk geseculariseerd. Dit komt onder andere naar voren in het grote aantal kerkverlaters. Daarom is kerkverlating een belangrijk sociologisch onderwerp. Mensen die de kerk verlaten doen dit meestal al voor hun twintigste. Omdat ze dan vaak hun opleiding nog niet voltooid hebben en nog niet aan hun eerste echte baan zijn begonnen, wordt veel naar de invloed van ouderlijke kenmerken gekeken. Bij de ouderlijke socialisatie zijn twee kenmerken van belang: de religiositeit en de 'rationaliteit'. Hoe religieuzer de omgeving waarin men opgroeit, des te kleiner de kans dat men de kerk verlaat. Rationaliteit verwijst naar de mate van wetenschappelijk denken. Wetenschappelijke verklaringen zijn nogal eens in strijd met religieuze verklaringen. Wanneer men meer met wetenschap in aanraking komt, is de kans dat men de kerk verlaat groter. Voor het effect van religiositeit wordt naar vaders kerkbezoek gekeken en voor het effect van rationaliteit naar vaders opleiding. Als geen rekening wordt gehouden met meetfouten, blijkt dat de kans op kerkverlating kleiner is naarmate de vader vaker naar de kerk ging. Een hogere opleiding van de vader blijkt de kans op kerkverlating juist te vergroten. Deze ondersteuning van zowel de religiositeits- als de rationaliteits hypothese is overeenkomstig eerder onderzoek. Rekening houden met meetfouten leidt tot een versterking van zowel het effect van vaders kerkbezoek als vaders opleiding. De verschillen tussen de gecorrigeerde en de ongecorrigeerde effecten zijn echter niet significant. Wederom speelt gecorreleerde meetfout geen rol.

Conclusie

Gezinsachtergrond variabelen bevatten random meetfout. De betrouwbaarheid van deze variabelen ligt rond de .75. Dit is iets, maar niet eens zo heel veel lager dan de schattingen van de betrouwbaarheid van de informatie die respondenten over zichzelf verstrekken in dit onderzoek. Er is nauwelijks sprake van gecorreleerde meetfout. De meetfout-correlaties die werden gevonden waren kleiner dan .05, met uitzondering van de meetfout-correlatie tussen de culturele consumptie van de ouders en die van hun volwassen kinderen.

Over het algemeen worden de effecten van gezinsachtergrond onderschat wanneer geen rekening wordt gehouden met meetfouten. In de gevallen waarin een effect wordt overschat, zijn er altijd andere variabelen in het model die onderschat worden.

Ook wanneer men beschikt over informatie van slecht één informant, is het mogelijk om rekening te houden met meetfouten door middel van de in dit onderzoek gevonden groottes van de meetfouten. Het valt aan te raden om dit te doen, aangezien de effecten van gezinsachtergrond variabelen sterk vertekend kunnen zijn.

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Curriculum Vitae

Jannes de Vries was born in Alkmaar, the Netherlands on December 13, 1976. He studied Sociology at Utrecht University from 1995 to 2000. During his studies he participated in the *Intensive Programme on Statistical Modelling* in Vienna and the *Summer School in Social Science Data Analysis and Collection* in Essex. He was a Ph.D. student at the Interuniversity Center for Social Science Theory and Methodology (ICS) and the Department of Sociology, Radboud University Nijmegen from 2000 till 2005. Here he conducted the research which was subsidized by NWO and resulted in this book. In 2003 he spent two months at the Department of Social Research Methodology of the Free University in Amsterdam, where Harry Ganzeboom was his host. Currently, he is employed as a postdoctoral researcher at the Department of Social Cultural Sciences at Tiburg University, investigating life-course effects and intergenerational solidarity.

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